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FINAL REPORT

TESTING AND EVALUATION OF SPECIALTY ARCHITECTURAL COATINGS

CONTRACT #A4-166-48

CAECOAST ANALYTICAL LABS

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PREPARED FOR CALIFORNIA AIR RESOURCES BOARD

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DISCLAIMER

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1. ABSTRACT

This study deals with the evaluation of currently available water borne and/or low solvent content products within fourteen ARB cited categories of specialty air drying architectural coatings for compliance with acceptable commercial use standards.

The compositional properties evaluated included calculated volatile organic compound (VOC) content. The fourteen (14) categories examined were selected from a group of twenty four (24) categories for which coating manufacturers have been unable to develop coatings to comply with low solvent regulations.

A testing format was chosen to provide performance and compositional information allowing comparison of low solvent or water borne coatings with currently accepted industry standards.

Samples for the study were obtained by a third party and coded to provide a double blind test method.

The coatings were evaluated for volatile organic content compliance with the existing Technical Review Group approved architectural coatings rule and evaluated within each use category for market acceptability.

The "State of the Technology" of polymer and additive development and formulation of high solids and water borne coatings is explored.

2. SUMMARY AND CONCLUSIONS

Although some portion of thirty seven criteria were tested for each sample (see Test Protocol pg. 42), some criteria are more specific to rating a coating for its efficacy within a category. For the purpose of this evaluation, certain test results are assigned weighting factors to highlight their usefulness as prime criteria in arriving at a numerical rating for each of the samples tested. In our experience the prime criteria chosen are the most useful within the framework of the California Air Resources Board definitions (pg. 47). The ratings are tabulated in the Review of Performance Properties (pg. 33).

Category 1: Concrete Curing Compounds

Five of the samples out of a total of ten were V.O.C. compliant with V.O.C. limit of 350 gms/litre. The overall performance and specifically moisture retention and alkali resistance properties were superior for non-compliant coatings (samples 1,5,6,7). A two component high solids system (sample 3) showed similar performance properties to the noncompliant coatings but historically a two component system is labor intensive and generally more expensive than single component coatings. The prime criteria in this category are moisture retention, alkali resistance, adhesion, application properties and stability of the product. These account for 85% of the rating assigned to each of ten samples. Water based V.O.C. compliant coatings tested were unacceptable substitutes for existing concrete curing compounds.

Category 2: General Sealers-Concrete

The product information supplied with coatings in this category specified concrete and masonry as substrate and therefore the heading is more appropriately "Concrete Sealers."

All four coatings evaluated were V.O.C. compliant with the limit of 350 gms/litre. Only two of the total four samples were recoatable and since recoatability is, by definition of this category, a primary function, two coatings (samples 3, JFN-12) are eliminated as useful or acceptable. The remaining coatings are low solids (25%), low viscosity polymer emulsion concrete sealers. Both coatings showed fair to poor humidity resistance, no resistance to ferrous metal bleeding and marginal adhesion to concrete. We conclude that this category was under-sampled and that the samples submitted do not meet with the current market demands for concrete sealers. Eight prime criteria, notably adhesion and recoatability (30% of total), were used to assign ratings to the four samples tested. Evaluation criteria also included stability, dry time, enamel holdout, application properties, humidity resistance and stain resistance.

Category 3: Industrial Maintenance Primers

All seven samples submitted were V.O.C. compliant with the limit of 420 gms/litre. Two coatings, one pigmented polymer emulsion (sample 16-1) and one high solids solvent based formulation (sample JFN-1), showed overall best performance and provide reasonable and acceptable levels for current use requirements. The high solids coating was slower drying and required reduction with 1.1.1 Trichloroethane to allow satisfactory spraying but was easily brush and roller applied directly from the container. The superior moisture resistance characteristics of sample 16-1 over other polymer emulsion coatings in this category indicates that proper selection of polymer and formulation are requisite for acceptable performance of waterborne coatings. Eight primer criteria including salt spray corrosion resistance, enamel holdout and intercoat adhesion account for 90% of the rating assigned each of seven samples.

The duration of salt spray testing was 200 hours ASTM B117, 5% salt solution. The C.A.R.B. definition for this category is vague and implies that in severe corrosion environments ferrous metal can be adequately protected by samples represented in this category. There is no comparison between the efficacy of samples tested in terms of corrosion resistance with, for example, either organic or inorganic zinc rich primers.

The best performance of the water based submittals is comparable to lower cost alkyd primers such as Federal Specification TTP636.

Differentiation must be made between short term maintenance cycle coatings and those which are required to provide long term service under more severely corrosive conditions.

Category 4: Industrial Maintenance Topcoats

All nine samples submitted were V.O.C. compliant with the limit of 420 gms/litre. By definition chemical, abrasion, ultra violet and water resistance comprise the major evaluation criteria for this category. In general, salt spray resistance is poor for all water based coatings. One high solids formulation (JFN2) showed best overall performance. Typically, the dry time was longer than for waterborne coatings, and a reduction in viscosity by a 10% by volume dilution with 1.1.1 Trichloroethane was necessary to allow satisfactory spraying properties. None of the water based products provides satisfactory performance properties. The V.O.C. level of the high solids coating (159 gms/litre) is substantially lower than the projected 420 gms/litre limit. The high solids coatings are much more difficult to apply than conventional solvent borne systems.

Category 5: Lacquers

Two samples out of a total of five were compliant with the limit of 680 gms/litre. Three samples were conventional solvent based lacquers (samples 1,2,3). Two conventional products had V.O.C. levels extremely close to the projected 680 gms/litre. Of the two compliant coatings evaluated, one waterborne (solution) resin performed practically equally to the conventional coatings. Two major areas of failure of both water based coatings were grain raising on wood, and corrosion resistance on ferrous metal.

Other physical properties of the solution water based lacquer are equal to the conventional lacquer coatings including adhesion, flexibility, impact resistance, hardness and drytime. The V.O.C. of the water based lacquer is essentially zero. Of the eight prime criteria used to provide 80% of the rating for the five samples in this category, dry time, adhesion, hardness and application properties provided the best methods for differentiation between the samples tested.

We conclude that the existing grain raising problem limits the water based lacquer usefulness on wood; the poor corrosion resistance properties limit use to well primed steel.

This category was not adequately represented by waterborne coatings.

Category 6: Opaque Stains

A total of eleven samples were submitted for evaluation. Seven samples were V.O.C. compliant with the limit of 350 gms/litre. One coating was solvent based and was very close to V.O.C. compliance. Ten samples were waterborne. Water based opaque stains showed performance properties equal to or exceeding conventional solvent based stains. We assumed the purpose of this category was for exterior application and thus grain raising was given a lower weighting. Water repellancy and bleed resistance appeared to be a formulation dependant parameter since efficacy varied greatly between coatings of similar generic composition. The prime criteria for this category which were given a total of 70% weighting were accelerated weathering resistance, hiding power (contrast ratio) and to a lesser extent, water repellancy, dry time, and package stability. We conclude that V.O.C. compliant waterborne coatings meet the standards of current market demands.

Category 7: Opaque Wood Preservatives

Four samples were evaluated in this category and only one was V.O.C. compliant with the limit of 350 gms/litre. The compliant coating gave overall fair performance but does not equal the efficacy of the non-compliant coatings. This category was under-sampled. The two primary weighting criteria were fungus resistance and water repellancy comprising 60% weighting. No conclusions can be made with respect to the usefulness of V.O.C. compliant coatings due to under sampling.

Category 8: Quick Dry Enamels

None of the six samples evaluated were V.O.C. compliant with the limit of 400 gms/litre. One water based enamel with a V.O.C. of 505 gms/litre showed excellent performance properties within the category definition. Three of the solvent based coatings had V.O.C. levels of approximately 450 gms/litre which is close to the current requirement. The water based coatings failed salt spray exposure but only minor weighting was given to corrosion resistance. Of the eight prime criteria weighted, one or more of block resistance, gloss and adhesion tests were failed by five of the six samples. We conclude that water based quick dry enamels can be formulated to perform to industry requirements but not within the proposed V.O.C. limits using V.O.C. minus water calculations.

Category 9: Roof Coatings

Six samples were evaluated. All were V.O.C. compliant with the limit of 300 gms/litre. The sampling in this category was not representative of the spectrum of currently marketed types of fluid applied roof coatings. Of six samples, three were asphalt or modified asphalt coatings. One sample (#4) was clearly a patching material with an extremely high viscosity and should more correctly be evaluated with category 13. A high weighting factor was assigned to tensile/elongation properties which improved the rating performance of the three water based samples. The water based samples are more properly represented in category 13 as elastomers.

Although the weighted performance criteria assigned apparently superior properties to the water based materials, by definition Roof Coatings should be more heavily evaluated for ponding water and moisture vapor transmission data. The water based coatings all showed inferior ponding water resistance. The asphaltics gave poor ultra violet resistance results and are therefore unacceptable as a roof coating without some type of U.V. resistant surface coating. We believe that roof systems should be evaluated, not simply roof coatings.

We conclude that the waterborne submittals are not useful as primary roof coating membranes but as secondary surface coatings on well drained (non ponding) roof surfaces.

The high solids compliant coatings have limited usefulness as roof coatings due to poor ultra violet resistance.

Category 10,11,12: Specialty Primers, Sealers and Undercoaters

Six total samples were evaluated; five were V.O.C. compliant with the limit of 350 gms/litre. The criteria used for evaluation of the performance properties of the six samples were application properties, adhesion, humidity resistance and alkali resistance. All of the V.O.C. compliant coatings achieved similar ratings and performed slightly better than the V.O.C. non-compliant coating.

Grain raising was included as an evaluation criteria for specialty undercoaters since traditionally undercoaters are used on wood. The information supplied with the samples in most cases did not delineate specific specialty function and therefore only general tests were performed within categories 10,11 and 12.

Specialty functions include:

- a. adhesion to deteriorated or chalky masonry
- b. resistance to ferrous metal bleed
- c. resistance to asphalt bleed
- d. sealing smoke damaged substrata, etc.

The evaluation indicates that the performance for compliant vs. non-compliant coatings is generally equal but in the absence of the critical use weighting factor, no real conclusions with respect to efficacy can be made.

Category 13: Waterproofing Mastics-Elastomers

Five samples of six total were V.O.C. compliant with the limit of 300 gms/litre. The samples consisted primarily of asphaltic (cut backs) solutions and generally ranged around 250 gms/litre V.O.C. These coating types are generally used as roof patching materials or for below grade vertical waterproofing. By definition only one sample was correctly allocated as a high build elastomer.

Alkali resistance was added to this category as an important evaluation factor.

All of the asphaltic materials exhibited equal alkali resistance to JFN-11. The ponding water resistance in this category is more appropriately replaced by moisture vapor transmission tests. Tensile/elongation values were heavily weighted and generally failed by the asphaltic coatings.

We conclude that high solids asphaltic coatings meet both the V.O.C. limits and current market demands for waterproofing mastics. None of the asphaltics function as elastomers.

Category 14: Waterproofing Sealers

A total of nine samples were evaluated of which two samples were V.O.C. compliant with the limit of 400 gms/litre. The best rating was achieved by V.O.C. non-compliant coatings.

Alkali resistance and water repellancy were generally better for non-compliant coatings, but sample 1 and JFN-10, both V.O.C. compliant coatings gave excellent alkali resistance and reasonable water repellancy values. Both tests were used as prime evaluation criteria.

We conclude that in general, non compliant coatings are superior in this category. High solids solvent based coatings perform adequately and are comparable to conventional V.O.C. non compliant coatings but require reduction with exempt solvents for spray application.

General Comments

In all categories of coatings tested which require low water permeance such as #1 Concrete Curatives, #3 and #4 Industrial Maintenance Primers and Topcoats, #9 Roof Coatings, #13 and 14 Waterproofing Mastics and Sealers, the waterborne coatings as emulsions, solutions or dispersions performed unsatisfactorily.

In categories #5 Lacquers, #8 Quick Dry Enamels, or #6 Opaque Stains where corrosion resistance or moisture is of limited concern, water based coatings perform satisfactorily in the majority of physical properties and High Solids Coatings provide equal corrosion control properties to conventional systems but in general are slower curing and more difficult to apply, requiring reduction with exempt solvents to maintain V.O.C. compliance levels.

In our gas chromatographic analysis of solvent borne coatings in this study with high and low solids, no exempt chlorinated solvents were detected.

It appears that the manufacturers of Architectural Coatings are avoiding the use of chlorinated solvents despite the exempt status. We believe the avoidance of chlorinated solvents is due to possible harmful health effects.

Two component systems such as epoxy-polyamide, epoxy acrylates, polyurethanes, urethane acrylics and the like offer a solution to corrosion control and moisture permeability but are in general difficult to use and expensive when compared to conventional non compliant coatings.

The future of waterborne coatings as adequate replacements for conventional low solids coatings will depend on providing an improved mechanism of curing or cross linking of the dispersion resins and a reduction of persistent hydrophylic functionality.

In macromolecular emulsions, polymer research is currently being undertaken to reduce the effect of residual surfactants, optimize the structure, particle size distribution, and functionality of the polymers to reduce both resolution potential and interstitial voids.

The coatings industry does not have available at this time broad spectrum polymer systems which will function with equivalent efficiency when compared to traditional low solids coatings in economy or performance.

3. RECOMMENDATIONS

Category 1: Concrete Curing Compounds

The non-compliant coatings are superior in performance to V.O.C. compliant coatings. The closest value, 470 gms/litre, exceeds the recommended limit of 350 gms/litre. The only exception to non compliant coating superiority is a two component epoxy system with a V.O.C. of 303 gms/litre. This type of coating is probably more expensive and more difficult to use than present non V.O.C. compliant systems. We recommend that the proposed V.O.C. limit be increased to 470 gms/litre.

Category 2: General Sealers

No recommendations are made for this category based on undersampling. Only four samples were provided for testing and only two of the samples passed recoatability tests. All of the coatings evaluated were designed for concrete.

Category 3: Industrial Maintenance Primers

The current proposed V.O.C. limit is 420 gms/litre. We recommend that this category be redefined to exclude certain industrial environments where severe corrosion conditions prevail.

None of the samples submitted has corrosion resistance properties approaching other single component zinc rich organic or inorganic primers.

The 420 gms/litre limit should apply to use requirements similar to currently marketed shop primers such as TTP636.

Category 4: Industrial Maintenance Topcoats

We recommend that the proposed limit be maintained at 420 gms/litre. The performance properties of one high solids coating indicate that potentially a lower V.O.C. limit can be proposed.

All of the water based samples failed corrosion resistance tests. The definition of industrial maintenance topcoats is vague in that no differentiation of levels of corrosion inhibition is cited. The performance level of the tested V.O.C. compliant coatings is equal to that of Federal Specification TTE489, Alkyd Gloss Enamel.

Category 5: Lacquers

The proposed limit of 680 gms/litre has been effected by the industry. Further evaluation of waterborne systems is recommended.

Performance evaluation of water based lacquers shows promise for eventual reduction of the current V.O.C. limit.

Category 6: Opaque Stains

We recommend that the proposed V.O.C. limit be maintained a 350 gms/litre. V.O.C. compliant stains performed equal to non compliant stains. This category provides potential for further V.O.C. reductions.

Category 7: Opaque Wood Preservatives

We recommend further sampling and evaluation in this category since only four samples were tested and only one sample was V.O.C. compliant. The compliant coating was ranked 3rd out of four and failed water repellancy tests.

Category 8: Quick Dry Enamels

We recommend that the proposed V.O.C. limit of 400 gms/litre be increased to 450 gms/litre. None of the coatings evaluated in this category complied with the 400 gms/litre limit.

Category 9: Roof Coatings

No recommendations are made for this category based on inadequate sampling. The samples submitted were not representative of the broad range of currently marketed roof coatings.

Category 10,11 and 12: Specialty Primers, Sealers, Undercoaters

These categories require more evaluation based on the specialty use of individual coatings. Inadequate information was provided with sampling to allow specific use capabilities of the coatings.

Category 13: Waterproofing Mastics- Elastomers

We recommend the current proposed V.O.C. limit of 300 gms/litre be maintained. The high solids coatings evaluated performed satisfactorily for current market demands.

Category 14: Waterproofing Sealers

We recommend that the proposed V.O.C. limit of 400 gms/litre be maintained. The recommendation is based on one pigmented high solids coating which performed equal to non compliant coatings.

4. CONTRACT HISTORY

Air pollution created by organic solvent emissions during the manufacturing and curing process of applied coatings creates serious health and environmental problems. Photochemically reactive solvents such as branched ketones, the various aromatics normally associated with other low molecular weight hydrocarbon emissions, and nitrogen oxides undergo ultra-violet catalysis creating ozone and other oxidants. Low level organic solvent systems for coatings provides a means of significantly reducing current organic pollutant levels.

The substitution for solvent dispersable resin systems by low molecular weight hydrophylic dispersion resins, colloidal dispersions and macromolecular emulsion polymers or low molecular weight solution resins in coatings creates physical and performance problems intrinsic to the chemical and physical properties of the molecular system. These problems must be overcome by formulation to comply with product use requirements.

The contract for Testing and Evaluation of Specialty Architectural Coatings #A4-166-48 was awarded to Calcoast Labs in July, 1985 by the California Air Resources Board (C.A.R.B.) to investigate progress by the coatings manufacturing industry in the reduction of volatile organic compounds in certain Architectural Coating categories. The purpose of the work was to evaluate volatile organic level in unit volumes of coating manufactured and assess the performance and application properties of low level organic solvent coatings compared with conventional solvent based coatings.

Problems were encountered in instrumenting and awarding a separate contract for a sample collection program with a third party not associated with Calcoast Labs. The sampling contract was awarded to Athey Technologies.

The first samples were received by the laboratory on March 13, 1986. Between March 13 and March 25, fifty five samples were received. Between March 26 and April 30, thirty three further samples were received, for a total of eighty eight (88).

Testing was initiated immediately upon sample acquisition and it became apparent within one (1) week of testing that duplicate samples had been provided to the laboratory. C.A.R.B. was notified of these redundant test results and a total of seven (7) duplicates were identified. Testing of duplicate samples was terminated under C.A.R.B. direction. The total number of testable samples was therefore reduced to eighty one (81).

A total projected sampling for the contract included six (6) samples in each of fourteen (14) categories with the exception of category 3 Industrial Maintenance Primers and category 4 Industrial Maintenance Topcoats. It was assumed that four (4) resin types could be sampled in each of categories 3 and 4 and therefore the total samples would be one hundred and twenty (120).

| Categories | Total Samples |
|------------|---------------|
| 12 x 6 = | 72 |
| 2 x 24 = | 48 |
| <u>14</u> | <u>120</u> |

Difficulty was encountered by the sample acquisition contractor in finding the six samples in each of four differing resin types for categories three, Industrial Maintenance Primers, and four, Industrial Maintenance Primers which complied with projected VOC limits.

The cost of testing duplicates which were abandoned after discovery used up a significant amount of the category 3 and category 4 budgets.

The unit contract price for testing the projected twenty four samples in categories 3 and 4 were substantially lower than unit costs in the twelve other categories due primarily to reduced laboratory costs.

The total sample budget was therefore reduced to ninety five (95) samples.

With the aforementioned eighty one (81) testable samples we were concerned with distribution. Assuming an even distribution of six samples per category, the following discrepancies occurred:

| <u>Category</u> | <u>Total Samples</u> |
|-----------------|----------------------|
| 2 | 3 |
| 5 | 4 |
| 7 | 3 |
| 13 | 5 |

(ie) 9 total samples deficient in four categories

C.A.R.B. was apprised of this fact and accordingly, the laboratory received eight (8) samples labelled JFN on July 11, 1986.

Initial tests were run to determine V.O.C. in order to select the most valuable samples based on:

- a. V.O.C. compliance
- b. Distribution into deficient categories

Only one sample, JFN 5 (category 5) fit into a sample deficient category. All JFN samples proved to be V.O.C. compliant and were thus incorporated into the test program. Total samples 89.

Additional samples received:

JFN 11 (category 13) and JFN 12 (category 2) were received on Sept 10, 1986

JFN 13 (category 7) was received on October 15, 1986

All samples relieved deficiencies in categories and were included in our testing. Total samples 92.

We increased total samples to 95 by including three samples from our reserve of over-sampled categories which tested as VOC compliant.

As it was important to complete testing of all of the later submittals, a final or interim report was delayed.

Calcoast Labs, as a fully equipped Coatings Testing Laboratory, provided a revised testing protocol for each of the fourteen coating categories based on the original request for proposals from C.A.R.B.

The test procedures used were from either American Society for Testing Materials (ASTM) or U.S. Federal Test Method Standard 141.

5. CATEGORY, NUMERICAL DESIGNATION

The following numerical designation for the tested categories is used in the text.

| Category | Total Samples Tested |
|---------------------------------------|----------------------|
| 1. Concrete Curing Compounds | 10 |
| 2. General Sealers | 4 |
| 3. Industrial Maintenance Primers | 7 |
| 4. Industrial Maintenance Topcoats | 9 |
| 5. Lacquers | 5 |
| 6. Opaque Stains | 11 |
| 7. Opaque Wood Preservatives | 4 |
| 8. Quick Dry Enamels | 6 |
| 9. Roof Coatings | 6 |
| 10. Specialty Primers | 6 |
| 11. Specialty Sealers | 6 |
| 12. Specialty Undercoaters | 6 |
| 13. Waterproofing Mastics- Elastomers | 6 |
| 14. Waterproofing Sealers | 9 |

6. DISCUSSION OF TEST RESULTS

CATEGORY 1: Concrete Curing Compounds

A weighting factor of 30 was allocated to moisture retention, ASTM C156. The uncoated control in these tests averaged $1.3 \text{ Kg/M}^2 \cdot 24 \text{ hrs.}$ and therefore an arbitrary efficacy number of $0.25 \text{ Kg.M}^2 \cdot 24 \text{ hrs.}$ was assigned and the rating scaled accordingly.

With the exception of sample 3, the compliant water based coatings gave the highest moisture losses. Further, the compliant coatings, with the exception of the two component epoxy (#3) exhibited no alkali resistance.

The highest ratings were allocated to the non compliant coatings which ranged in VOC from 470-698 gms/litre.

The only compliant coating showing equal performance within the assigned weighting is a two component, low solvent system.

CATEGORY 2: General Sealers-Concrete

This category was changed from "General Undercoaters" to "General Sealers" by C.A.R.B. The test protocol originally submitted was therefore revised to include Recoatability with:

- a). Flat Exterior Acrylic Coating (waterbased), meeting Federal Specification TTP19C
- b). Alkyd Gloss Enamel, meeting Federal Specification TTE489

and tested for intercoat adhesion using ASTM D3359.

A second revision in test protocol changed the "Bleed Resistance" test normally used for wood sealers and undercoaters to "Rust Stain Resistance" since the product information provided indicated that all samples were to be applied to concrete and masonry surfaces.

All samples were clear polymer emulsion types and all had compliant V.O.C.

Sample 3 and JFN-12 appear to be silicone based emulsions. Both samples exhibit poor recoatability.

Sample 3 also exhibits an objectionably strong amine/ammonia odor.

Sample 3 has an initial viscosity of 37,000 cps and requires a 60% reduction with water in order to spray satisfactorily.

Category 3: Industrial Maintenance Primers

All samples are compliant and with the exception of JFN-1 are all waterborne. The high solids sample JFN-1 exhibited longer curing times than the waterbased coatings and was slower to develop adhesion. Salt spray resistance was heavily weighted in our evaluation since maintenance primers are often left uncoated for various time periods. Samples 2 and 3 are water dispersible alkyds; the balance of the water based submittals are polymer emulsion types. The highest ratings overall were given to sample 1, a pigmented emulsion coating and JFN-1, a high solids solvent based coating. The initial viscosity of the high solids coating is slightly high for conventional spray and required 10% reduction with 1.1.1 Trichloroethane.

Category 4: Industrial Maintenance Topcoats

Salt spray resistance was given highest weighting in our evaluation, with accelerated weathering (U.V. Resistance) and application properties equal secondary factors.

All samples are polymer emulsion types with the exception of JFN-2 which is solvent based high solids, and JFN-7 which is a water dispersible alkyd.

The highest rating was given to the high solids, solvent based sample JFN-2 due primarily to superior humidity and salt spray resistance. Typically, the high solids sample JFN-2 exhibited slow cure time as opposed to the water based coatings.

Category 5: Lacquers

Samples 1, 2 and 3 are conventional nitrocellulose type lacquers. Both sample 1 and 3 are extremely close to the 680 gms/litre VOC limit but our testing indicates minor non-conformity. Samples 4 and 5 are water based, sample 4 is a solution resin, sample 5 is a polymer emulsion.

We assumed, due to lack of product information, that the major substrate in this category was wood.

Only minor value was placed on accelerated exposure and salt spray resistance since we assumed interior use for this category.

Adhesion tests were, however, performed on both wood and steel.

The conventional lacquers (1,2,3) were rated highest, primarily due to a grain raising factor evaluated as "other" properties.

Category 6: Opaque Stains

A total of eleven (11) samples were tested. The samples were water based with the exception of sample 8. Of the water based submissions, sample 4 is a water soluble resin type, the balance are polymer emulsions with varying degrees of emulsified alkyds/oils modification. Sample 8 was very close to compliance due to a high solids level, all other samples are VOC compliant (<350 gms/litre).

The highest performance rankings were achieved by samples in each of the water soluble, water based polymer emulsion and solvent based high solids coatings sub-categories.

Dry time of the oil based sample 8 was typically longer than the water based samples. Grain raising was not given high weighting value since we assumed primarily exterior use for this category.

Category 7: Opaque Wood Preservatives

Of four samples submitted, only one (JFN-13) is VOC compliant and appears to be an oil emulsion.

Water repellancy and fungus resistance were heavily weighted in our evaluation.

The standard industry treatment which was represented by sample 1, Creosote Oil, showed the poorest fungus resistance.

Samples 1, 2 and 3 are non compliant and VOC's range from 498-643, which are extremely high when compared to the 350 gms/litre limit.

Category 8: Quick Dry Enamels

A total of six samples were evaluated. Samples 2 and 4 are water based. The balance are non compliant solvent based enamels.

Salt spray resistance was weighted lightly since the category definition excludes corrosion resistance properties. Both water based products dried much more rapidly than the solvent based samples, but all samples fall within the stated maximums (set to touch less than two hours, dry hard less than eight hours).

Unfortunately, only one water based compliant coating had a 60° gloss greater than 70, a stated requirement for inclusion in this category. Block resistance, while not by definition an evaluation parameter was given a W.F. of 10 which has skewed the totals in favor of sample 2, a water based enamel.

Category 9: Roof Coatings

Samples 1, 2 and 3 are water based; samples 4, 5 and 6 are solvent based asphaltic mastics. Samples 1 and 3 are white and are useful primarily as high reflectance coatings. Sample 2 is a black water based elastomer.

Confusion exists in the allocation of samples to category 9 and category 13, Waterproofing Mastics and Elastomers.

The evaluation criteria used for both categories was practically identical.

The asphaltic mastics are typical roof repair materials and not generally used as total area roof coatings.

The asphaltics react poorly to ultra violet exposure and typically exhibit low moisture transmission and good ponding water resistance. Tensile strength and elongation weighting gave advantage to the water based coatings in overall rating.

Category 10, 11 and 12: Specialty Primers, Sealers and Undercoaters

The definition provided by C.A.R.B. grouped the coatings into one functional category.

The information accompanying the samples differentiated substrata in some cases but not precise function: (ie) was the coating used primarily for sealing smoke or water damaged walls, etc.

As a result specific test conditions were not employed, but general tests such as bleed resistance on wood, alkali resistance and humidity resistance were used for all three categories.

The evaluation was necessarily common for categories 10, 11 and 12 and may not represent efficacy of specific use products.

Category 12 included a weighting factor for grain raising of wood.

In category 10 and 11 compliant coatings generally showed superior overall performance.

Category 12: Specialty Undercoaters

Undercoaters are generally accepted as pigmented coatings as opposed to sealers.

Samples 2 and 4 are clear coatings for concrete and should be evaluated within category 11.

Samples 1, 3, 5 and 6 are pigmented undercoaters.

Category 13: Waterproofing Mastics- Elastomers

Samples 2 thru 7 are asphaltic mastics. Sample JFN 11 is completely dissimilar and appears to be a silicone based elastomeric wall coating. The asphaltic coatings are more correctly placed in category 9, Roof Coatings. Roof coatings were more heavily weighted on ponding water resistance, and the waterproofing mastics, since they ultimately are used on concrete and masonry surfaces require better tensile/elongation characteristics.

Category 14: Waterproofing Sealers

Sample 1 is an asphalt emulsion and should have been included in Category 9, Roof Coatings.

Sample 2, 3, 4, 6 and 9 are clear, low viscosity, low solids concrete water repellant/sealers. Sample 10 is a low viscosity, pigmented sealer.

Water repellancy was a major evaluation factor and it was generally noted that the non compliant coatings exhibited better water repellancy after accelerated U.V. exposure.

Only two compliant coatings out of a total of eleven were tested. Of compliant coatings sample 1 is incorrectly categorized, sample JFN 10 is unstable.

Low solids waterborne coatings are subject to the trauma of the currently adopted "V.O.C. minus water" calculation which converts innocuous 40 gms/litre of organic volatile coatings to non compliant levels.

7. VOC COMPLIANCE

| Category | VOC ² Samples Comply | VOC ² Samples Non-comply | Total Samples |
|----------|---------------------------------------|---|------------------|
| 1 | 5 | 5 | 10 |
| 2 | 4 | 0 | 4 |
| 3 | 7 | 0 | 7 |
| 4 | 9 | 0 | 9 |
| 5 | 2 | 3 | 5 |
| 6 | 7 | 4 | 11 |
| 7 | 1 | 3 | 4 |
| 8 | 0 | 6 | 6 |
| 9 | 6 | 0 | 6 |
| 10 | 5 | 1 | 6 |
| 11 | 3 | 3 | 6 |
| 12 | 0 | 6 | 6 |
| 13 | 5 | 1 | 6 |
| 14 | 2 | 7 | 9 |
| Totals | <u>55</u> | <u>40</u> | <u>95</u> |

Calculations for Volatile Organic Content (VOC), were made for solvent based and water reducible coatings using the following formula from ASTM D3960:

$$A = (V_2 - W) (D_m) \times 10$$

where A = Volatile organic content (VOC-1)
V = Weight % total volatile including water
W = Weight % water
D_m = Density of coating gms/ml

For compliance evaluation purposes, the VOC content minus water (or exempt solvent) for coatings containing water or exempt solvents was calculated from VOC-1 using the following formula from ASTM D3960:

$$VOC_2 = \frac{VOC-1 \times 100}{100 - D_m (W)}$$

We assumed D_w = 1.0 (25°C) since the factor 0.997 has a trivial effect compared to errors in density measurement.

The following table shows the Technical Review Group (TRG) approved Architectural Coatings VOC limits. The limit units are in grams of volatile organic compounds per litre of total paint using the VOC-2 calculation.

TABLE 1

TRG APPROVED ARCHITECTURAL VOC LIMITS

| <u>CATEGORIES</u> | <u>1989 VOC LIMIT (g/l)</u> |
|------------------------|-----------------------------|
| 9, 13 | 300 |
| 1, 2, 6, 7, 10, 11, 12 | 350 |
| 8, 14 | 400 |
| 3, 4 | 420 |
| 5 | 680 |

VOC Compliance Review

| Category 1 | Sample # | VOC ¹ | VOC Limit 350 | VOC ² | Comply |
|-------------------|-----------|------------------|------------------|------------------|--------|
| | 2-13-1 | 698.02 | | 698.02 | |
| | 2-13-3A,B | 303.49 | | 303.49 | X |
| | 2-13-4 | 25.50 | | 178.19 | X |
| | 2-13-5 | 551.22 | | 551.22 | |
| | 2-13-6 | 627.51 | | 627.51 | |
| | 2-13-7 | 469.56 | | 469.56 | |
| | 2-13-8 | 1.40 | | 0.80 | X |
| | 2-13-9 | 0.10 | | 0.45 | X |
| | 2-13-10 | 4.27 | | 15.34 | X |
| | JFN #3 | 247.13 | | 573.38 | |
| Total Compliance: | | | | | 5 |

| Category 2 | Sample # | VOC ¹ | VOC Limit 350 | VOC ² | Comply |
|-------------------|----------|------------------|------------------|------------------|--------|
| | 2-14-1 | 16.81 | | 61.10 | X |
| | 2-14-2 | 12.71 | | 50.19 | X |
| | 2-14-3 | 14.12 | | 30.78 | X |
| | JFN #12 | 48.47 | | 97.95 | X |
| Total Compliance: | | | | | 4 |

| Category 3 | Sample # | VOC ¹ | VOC Limit 420 | VOC ² | Comply |
|-------------------|----------|------------------|------------------|------------------|--------|
| | 2-16-1 | 42.55 | | 90.28 | X |
| | 2-16-9 | 111.71 | | 220.98 | X |
| | 2-16-10 | 68.97 | | 138.38 | X |
| | 2-17-1 | 35.82 | | 70.08 | X |
| | 2-17-2 | 73.57 | | 151.56 | X |
| | 2-17-3 | 53.29 | | 128.59 | X |
| | JFN #1 | 256.02 | | 256.02 | X |
| Total Compliance: | | | | | 7 |

| Category 4 | Sample # | VOC ¹ | VOC Limit 420 | VOC ² | Comply |
|-------------------|----------|------------------|------------------|------------------|--------|
| | 2-19-1 | 89.43 | | 185.34 | X |
| | 2-19-2 | 72.31 | | 152.10 | X |
| | 2-19-3 | 52.83 | | 117.34 | X |
| | 2-19-4 | 18.16 | | 40.73 | X |
| | 2-19-5 | 72.23 | | 170.59 | X |
| | 2-19-6 | 54.72 | | 125.01 | X |
| | 2-20-1 | 105.31 | | 294.98 | X |
| | JFN #2 | 158.98 | | 158.98 | X |
| | JFN #7 | 218.85 | | 295.82 | X |
| Total Compliance: | | | | | 9 |

| Category 5 | Sample # | VOC ¹ | VOC Limit 680 | VOC ² | Comply |
|---------------|----------|------------------|------------------|------------------|---------------------|
| | 2-21-1 | 683.00 | | 683.00 | |
| | 2-21-2 | 742.00 | | 742.00 | |
| | 2-21-3 | 687.00 | | 687.00 | |
| | 2-21-4 | 46.22 | | 168.13 | X |
| | JFN #5 | 184.40 | | 439.67 | X |
| | | | | | Total Compliance: 2 |

| Category 6 | Sample # | VOC ¹ | VOC Limit 350 | VOC ² | Comply |
|---------------|----------|------------------|------------------|------------------|---------------------|
| | 2-22-1 | 148.33 | | 622.71 | |
| | 2-22-2 | 252.80 | | 410.99 | |
| | 2-22-3 | 114.44 | | 251.24 | X |
| | 2-22-4 | 193.33 | | 411.51 | |
| | 2-22-5 | 17.43 | | 62.31 | X |
| | 2-22-6 | 0 | | 0 | X |
| | 2-22-7 | 0.98 | | 2.28 | X |
| | 2-22-8 | 351.17 | | 358.30 | |
| | 2-22-9 | 97.83 | | 185.28 | X |
| | JFN #6 | 16.39 | | 70.34 | X |
| | JFN #8 | 108.76 | | 284.26 | X |
| | | | | | Total Compliance: 7 |

| Category 7 | Sample # | VOC ¹ | VOC Limit 350 | VOC ² | Comply |
|-------------------|----------|------------------|------------------|------------------|--------|
| | 2-23-1 | 554.59 | | 554.59 | |
| | 2-23-2 | 498.13 | | 503.46 | |
| | 2-23-3 | 643.41 | | 668.40 | |
| | JFN #13 | 44.32 | | 137.46 | X |
| Total Compliance: | | | | | 1 |

| Category 8 | Sample # | VOC ¹ | VOC Limit 400 | VOC ² | Comply |
|-------------------|----------|------------------|------------------|------------------|--------|
| | 2-24-2 | 354.50 | | 505.27 | |
| | 2-24-4 | 268.91 | | 426.23 | |
| | 2-24-6 | 452.00 | | 452.00 | |
| | 2-24-7 | 451.00 | | 451.00 | |
| | 2-24-8 | 465.00 | | 465.00 | |
| | 2-24-9 | 497.11 | | 497.11 | |
| Total Compliance: | | | | | 0 |

| Category 9 | Sample # | VOC ¹ | VOC Limit 300 | VOC ² | Comply |
|-------------------|----------|------------------|------------------|------------------|--------|
| | 2-25-1 | 30.63 | | 54.82 | X |
| | 2-25-2 | 58.00 | | 96.13 | X |
| | 2-25-3 | 14.94 | | 27.85 | X |
| | 2-25-4 | 236.68 | | 236.68 | X |
| | 2-25-5 | 244.03 | | 244.03 | X |
| | 2-25-6 | 292.63 | | 292.63 | X |
| Total Compliance: | | | | | 6 |

| Category 10 | Sample # | VOC ¹ | VOC Limit 350 | VOC ² | Comply |
|-------------------|----------|------------------|------------------|------------------|--------|
| | 2-26-1 | 46.64 | | 161.32 | X |
| | 2-26-2 | 37.49 | | 157.19 | X |
| | 2-26-3 | 35.55 | | 145.93 | X |
| | 2-26-4 | 79.54 | | 192.82 | X |
| | 2-26-5 | 389.24 | | 389.24 | |
| | 2-26-6 | 0 | | 3.09 | X |
| Total Compliance: | | | | | 5 |

| Category 11 | Sample # | VOC ¹ | VOC Limit 350 | VOC ² | Comply |
|-------------------|-----------|------------------|------------------|------------------|--------|
| | 2-27-2 | 146.86 | | 280.58 | X |
| | 2-27-3 | 126.00 | | 731.35 | |
| | 2-27-4 | 652.30 | | 652.30 | |
| | 2-27-5A/B | 283.25 | | 283.25 | X |
| | 2-27-6 | 2.91 | | 6.33 | X |
| | 2-27-7 | 725.56 | | 725.56 | |
| Total Compliance: | | | | | 3 |

| Category 12 | Sample # | VOC ¹ | VOC Limit 350 | VOC ² | Comply |
|-------------------|----------|------------------|------------------|------------------|--------|
| | 2-28-1 | 547.49 | | 547.49 | |
| | 2-28-2 | 137.38 | | 743.80 | |
| | 2-28-3 | 397.58 | | 397.58 | |
| | 2-28-4 | 708.87 | | 708.87 | |
| | 2-28-5 | 483.52 | | 483.52 | |
| | 2-28-6 | 569.00 | | 569.00 | |
| Total Compliance: | | | | | 0 |

| Category 13 | Sample # | VOC ¹ | VOC Limit 300 | VOC ² | Comply |
|-------------------|----------|------------------|------------------|------------------|--------|
| | 2-29-2 | 261.92 | | 261.92 | X |
| | 2-29-3 | 239.30 | | 239.30 | X |
| | 2-29-4 | 253.15 | | 253.15 | X |
| | 2-29-6 | 220.13 | | 220.13 | X |
| | 2-29-7 | 390.13 | | 390.13 | |
| | JFN #11 | 98.20 | | 192.62 | X |
| Total Compliance: | | | | | 5 |

| Category 14 | Sample # | VOC ¹ | VOC Limit 400 | VOC ² | Comply |
|-------------------|----------|------------------|------------------|------------------|--------|
| | 2-30-1 | 7.36 | | 16.24 | X |
| | 2-30-2 | 40.26 | | 563.86 | |
| | 2-30-3 | 116.65 | | 652.40 | |
| | 2-30-4 | 84.40 | | 636.98 | |
| | 2-30-6 | 751.08 | | 751.08 | |
| | 2-30-7 | 406.56 | | 406.56 | |
| | 2-30-9 | 712.62 | | 712.62 | |
| | 2-30-10 | 438.50 | | 728.28 | |
| | JFN #10 | 219.62 | | 264.02 | X |
| Total Compliance: | | | | | 2 |

8. REVIEW OF PERFORMANCE PROPERTIES/RANKING

In order to rank the coating samples within a specific category for performance, a weighting factor (W.F.) was assigned to each test or test group. The weighting factor was derived from the C.A.R.B. category definition and from the ultimate use of the coating within the category.

The weighting factor value assigns relative importance of each of the criteria tested within a category and has been adjusted to provide a rating out of 100 for each sample submitted. The criteria designated "other" is a statistical average of the results of all the testing per Test Protocol (p. 12) not already assigned a weighting factor.

The ranking gives both information on relative performance of the specific samples tested and the viability of the coating compared to external standards such as federal specification coatings, when applicable, or currently accepted industrial standards.

CATEGORY 1- CONCRETE CURING COMPOUND

| | W.F. | 1 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | JFN3 |
|--------------------|------|-----|----|----|-----|-----|-----|----|----|----|------|
| 1. Moisture Ret. * | 30 | 25 | 30 | 5 | 20 | 20 | 30 | 5 | 5 | 5 | 5 |
| 2. Alkali Res. | 15 | 15 | 15 | 0 | 15 | 15 | 15 | 0 | 0 | 0 | 0 |
| 3. Appl. Prop. | 15 | 15 | 15 | 10 | 15 | 15 | 10 | 10 | 15 | 10 | 15 |
| 4. Stability | 10 | 10 | 10 | 5 | 10 | 10 | 10 | 10 | 10 | 10 | 10 |
| 5. Adhesion | 15 | 15 | 15 | 10 | 10 | 10 | 15 | 15 | 15 | 15 | 15 |
| VOC | | N/C | C | C | N/C | N/C | N/C | C | C | C | N/C |
| Other | 15 | 15 | 8 | 10 | 8 | 12 | 15 | 15 | 15 | 15 | 15 |
| TOTAL | 100 | 95 | 93 | 40 | 78 | 82 | 95 | 55 | 60 | 55 | 60 |

* Any number greater than 0.25 Kg/M².24 Hrs. fails

CATEGORY 2- GENERAL SEALERS- CONCRETE AND MASONRY

| | W.F. | 1 | 2 | 3 | JFN12 |
|------------------|------|----|----|----|-------|
| 1. Stability | 10 | 10 | 10 | 10 | 10 |
| 2. Dry Time | 10 | 10 | 10 | 10 | 10 |
| 3. Adhesion | 15 | 7 | 7 | 5 | 15 |
| 4. En. Holdout | 10 | 10 | 10 | 10 | 10 |
| 5. Appl. Prop. | 10 | 10 | 10 | 5 | 10 |
| 6 Humidity Res. | 10 | 6 | 6 | 9 | 10 |
| 7. Stain Res. | 10 | 0 | 0 | 8 | 8 |
| 8. Recoatability | 15 | 15 | 15 | 3 | 0 |
| VOC | | C | C | C | C |
| Other | 10 | 5 | 8 | 10 | 10 |
| TOTAL | 100 | 73 | 76 | 70 | 83 |

CATEGORY 3- INDUSTRIAL MAINTENANCE PRIMERS

| | W.F. | 16-1 | 9 | 10 | 17-1 | 2 | 3 | JFN1 |
|------------------|------|------|----|----|------|----|----|------|
| 1. Appl. Prop. | 10 | 8 | 10 | 10 | 5 | 0 | 10 | 10 |
| 2. Stability | 10 | 10 | 10 | 10 | 10 | 10 | 0 | 10 |
| 3. Dry Time | 10 | 10 | 10 | 10 | 8 | 6 | 10 | 5 |
| 4. Adhesion | 10 | 10 | 8 | 10 | 8 | 8 | 8 | 8 |
| 5. En. Holdout | 10 | 8 | 8 | 8 | 8 | 8 | 10 | 8 |
| 6. Salt Spray | 20 | 16 | 8 | 3 | 8 | 5 | 3 | 18 |
| 7. Humidity Res. | 10 | 10 | 10 | 10 | 10 | 0 | 10 | 10 |
| 8. Int. Adhesion | 10 | 10 | 9 | 10 | 8 | 9 | 10 | 8 |
| VOC | | C | C | C | C | C | C | C |
| Other | 10 | 9 | 9 | 9 | 7 | 9 | 7 | 9 |
| TOTAL | 100 | 91 | 82 | 80 | 72 | 55 | 68 | 86 |

CATEGORY 4- INDUSTRIAL MAINTENANCE TOPCOATS

| | W.F. | 19-1 | 2 | 3 | 4 | 5 | 6 | 20-1 | JFN2 | JFN7 |
|------------------|------|------|----|----|----|----|----|------|------|------|
| 1. Stability | 6 | 4 | 4 | 6 | 6 | 6 | 6 | 10 | 5 | 0 |
| 2. Appearance | 10 | 10 | 7 | 10 | 7 | 10 | 10 | 7 | 10 | 10 |
| 3. Appl. Prop. | 15 | 15 | 15 | 15 | 15 | 15 | 8 | 15 | 10 | 15 |
| 4. Cont. Ratio | 7 | 7 | 7 | 7 | 7 | 7 | 7 | 7 | 7 | 7 |
| 5. Acc. Weath. | 15 | 10 | 8 | 15 | 8 | 10 | 10 | 12 | 8 | 10 |
| 6. Humidity Res. | 7 | 2 | 3 | 3 | 2 | 0 | 7 | 3 | 7 | 0 |
| 7. Adhesion | 10 | 5 | 5 | 10 | 7 | 7 | 10 | 10 | 10 | 10 |
| 8. Salt Spray | 20 | 0 | 0 | 0 | 5 | 5 | 10 | 0 | 20 | 5 |
| VOC | | C | C | C | C | C | C | C | C | C |
| Other | 10 | 9 | 9 | 9 | 9 | 9 | 5 | 5 | 7 | 5 |
| TOTAL | 100 | 62 | 58 | 75 | 66 | 69 | 73 | 59 | 84 | 62 |

CATEGORY 5-LACQUERS

| | W.F. | 1 | 2 | 3 | 4 | JFN5 |
|------------------|------|-----|-----|-----|----|------|
| 1. Dry Time | 10 | 10 | 10 | 10 | 10 | 0 |
| 2. Adhesion | 10 | 8 | 5 | 8 | 8 | 10 |
| 3. Hardness | 10 | 10 | 8 | 7 | 7 | 7 |
| 4. Block Res. | 10 | 10 | 10 | 10 | 10 | 10 |
| 5. Stability | 10 | 10 | 10 | 10 | 10 | 8 |
| 6. Appearance | 10 | 10 | 10 | 10 | 10 | 10 |
| 7. Appl. Prop. | 10 | 10 | 8 | 10 | 7 | 10 |
| 8. Abrasion Res. | 10 | 10 | 10 | 10 | 10 | 5 |
| VOC | | N/C | N/C | N/C | C | C |
| Other | 20 | 17 | 15 | 15 | 8 | 10 |
| TOTAL | 100 | 95 | 86 | 90 | 80 | 70 |

CATEGORY 6- OPAQUE STAINS

| | W.F. | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | JFN6 | JFN8 |
|--------------------------|------|-----|-----|----|-----|----|----|----|-----|----|------|------|
| 1. Stability | 10 | 7 | 7 | 10 | 10 | 9 | 10 | 8 | 10 | 10 | 10 | 10 |
| 2. Dry Time | 10 | 10 | 10 | 10 | 10 | 9 | 6 | 7 | 5 | 8 | 8 | 10 |
| 3. Appearance | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 10 |
| 4. Appl. Prop. | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 10 |
| 5. Cont. Ratio | 15 | 15 | 15 | 15 | 15 | 15 | 15 | 15 | 15 | 15 | 15 | 10 |
| 6. Acc. Weath.* | 15 | 15 | 15 | 5 | 15 | 10 | 0 | 15 | 15 | 15 | 15 | 5 |
| 7. H ₂ O Rep. | 10 | 2 | 2 | 2 | 10 | 2 | 2 | 2 | 10 | 2 | 10 | 10 |
| 8. Grain Raising | 10 | 5 | 5 | 0 | 8 | 0 | 5 | 5 | 10 | 5 | 5 | 5 |
| VOC | | N/C | N/C | C | N/C | C | C | C | N/C | C | C | C |
| Other (Bleed, Adhesion) | 10 | 8 | 5 | 7 | 5 | 5 | 8 | 8 | 7 | 8 | 10 | 10 |
| TOTAL | 100 | 82 | 79 | 69 | 93 | 70 | 66 | 80 | 92 | 83 | 93 | 80 |

* $\Delta E > 3.0$ Fail

CATEGORY 7- OPAQUE WOOD PRESERVATIVES

| | W.F. | 1 | 2 | 3 | JFN13 |
|------------------|------|-----|-----|-----|-------|
| 1. Fungus Res. | 30 | 10 | 25 | 30 | 20 |
| 2. Water Rep. | 30 | 20 | 30 | 20 | 15 |
| 3. Stability | 10 | 10 | 10 | 8 | 10 |
| 4. Appl. Prop. | 10 | 5 | 10 | 10 | 10 |
| 5. Humidity Res. | 10 | 10 | 8 | 5 | 8 |
| VOC | | N/C | N/C | N/C | C |
| Other | 10 | 5 | 10 | 10 | 10 |
| TOTAL | 100 | 60 | 93 | 83 | 73 |

CATEGORY 8- QUICK DRYING ENAMELS

| | W.F. | 2 | 4 | 6 | 7 | 8 | 9 |
|--------------------|------|-----|-----|-----|-----|-----|-----|
| 1. Dry Time | 20 | 20 | 20 | 20 | 20 | 20 | 20 |
| 2. Block Res. | 10 | 8 | 10 | 0 | 0 | 0 | 0 |
| 3. Gloss | 10 | 10 | 0 | 10 | 0 | 10 | 10 |
| 4. Appl. Prop. | 15 | 15 | 8 | 15 | 15 | 15 | 15 |
| 5. Stability | 10 | 10 | 10 | 5 | 9 | 10 | 10 |
| 6. Adhesion | 10 | 10 | 0 | 10 | 10 | 10 | 10 |
| 7. Appearance | 10 | 10 | 5 | 10 | 10 | 10 | 10 |
| Salt Spray and W/O | 5 | 0 | 0 | 4 | 5 | 3 | 5 |
| VOC | | N/C | N/C | N/C | N/C | N/C | N/C |
| Other | 10 | 10 | 5 | 10 | 7 | 7 | 10 |
| TOTAL | 100 | 93 | 58 | 84 | 76 | 85 | 90 |

CATEGORY 9- ROOF COATINGS

| | W.F. | 1 | 2 | 3 | 4 | 5 | 6 |
|---------------------------|------|----|----|-----|-----|----|----|
| 1. Stability | 10 | 0 | 10 | 10 | 10 | 10 | 10 |
| 2. Ponding Water* | 20 | 10 | 10 | 0 | 20 | 18 | 18 |
| 3. Humidity | 10 | 5 | 5 | 10 | 10 | 10 | 10 |
| 4. Adhesion | 10 | 9 | 10 | 10 | 8 | 8 | 8 |
| 5. Application | 10 | 10 | 10 | 10 | 10 | 10 | 10 |
| 6. Acc. Weath. | 10 | 10 | 10 | 5 | 0 | 0 | 0 |
| 7. Tensile/ Elongation | 10 | 10 | 10 | 7.5 | 2.5 | 5 | 5 |

*192 hrs.

Elongation 200%
Tens. Strength 200 psi

| | | | | | | | |
|-------|-----|----|----|------|------|----|----|
| VOC | | C | C | C | C | C | C |
| OTHER | 20 | 18 | 18 | 20 | 10 | 5 | 5 |
| TOTAL | 100 | 72 | 83 | 72.5 | 70.5 | 66 | 66 |

CATEGORY 10- SPECIALTY PRIMERS

| | W.F. | 1 | 2 | 3 | 4 | 5 | 6 |
|----------------|------|----|----|----|----|-----|----|
| 1. Appl. Prop. | 10 | 10 | 5 | 5 | 8 | 10 | 8 |
| 2. Stability | 10 | 5 | 10 | 10 | 10 | 10 | 10 |
| 3. Dry Time | 10 | 10 | 10 | 10 | 10 | 6 | 10 |
| 4. Adhesion | 15 | 15 | 10 | 10 | 15 | 12 | 15 |
| 5. En. Holdout | 10 | 10 | 10 | 10 | 10 | 10 | 10 |
| 6. Bleed Res. | 5 | 5 | 5 | 5 | 1 | 3 | 1 |
| 7. Humidity | 10 | 10 | 10 | 10 | 5 | 5 | 2 |
| 8. Alkali Res. | 10 | 0 | 10 | 10 | 5 | 0 | 5 |
| VOC | | C | C | C | C | N/C | C |
| Other | 20 | 10 | 10 | 10 | 15 | 15 | 15 |
| TOTAL | 100 | 75 | 80 | 80 | 79 | 71 | 76 |

CATEGORY 11- SPECIALTY SEALERS

| | W.F. | 2 | 3 | 4 | 5A/B | 6 | 7 |
|------------------|------|----|-----|-----|------|----|-----|
| 1. Stability | 10 | 8 | 4 | 10 | 8 | 10 | 10 |
| 2. Dry Time | 10 | 10 | 8 | 10 | 8 | 10 | 0 |
| 3. Adhesion | 15 | 15 | 15 | 10 | 10 | 10 | 5 |
| 4. En. Holdout | 10 | 10 | 8 | 8 | 10 | 8 | 10 |
| 5. Appl. Prop. | 10 | 10 | 10 | 8 | 10 | 10 | 10 |
| 6. Alkali Res. | 10 | 10 | 0 | 0 | 10 | 0 | 0 |
| 7. Bleed Res. | 5 | 2 | 4 | 4 | 5 | 2 | 2 |
| 8. Humidity Res. | 10 | 5 | 0 | 4 | 10 | 10 | 8 |
| VOC | | C | N/C | N/C | C | C | N/C |
| Other | 20 | 20 | 10 | 18 | 18 | 20 | 18 |
| TOTAL | 100 | 90 | 59 | 72 | 89 | 80 | 63 |

CATEGORY 12- SPECIALTY UNDERCOATERS

| | W.F. | 1 | 2 | 3 | 4 | 5 | 6 |
|------------------|------|-----|-----|-----|-----|-----|-----|
| 1. Stability | 10 | 10 | 10 | 10 | 10 | 10 | 10 |
| 2. Dry Time | 10 | 10 | 10 | 8 | 10 | 10 | 10 |
| 3. Sanding Prop. | 10 | 10 | - | 10 | - | 10 | 8 |
| 4. Adhesion | 10 | 8 | 10 | 10 | 10 | 10 | 8 |
| 5. En. Holdout | 10 | 10 | 10 | 10 | 10 | 10 | 10 |
| 6. Appl. Prop. | 10 | 5 | 5 | 10 | 10 | 8 | 8 |
| 7. Bleed Res. | 10 | 5 | 0 | 10 | 5 | 0 | 5 |
| 8. Alkali Res. | 10 | 0 | 0 | 0 | 10 | 0 | 10 |
| 9. Grain Raising | 10 | 10 | 5 | 10 | 5 | 10 | 10 |
| VOC | | N/C | N/C | N/C | N/C | N/C | N/C |
| Other | 10 | 10 | 8 | 10 | 10 | 9 | 9 |
| TOTAL | 100 | 78 | 58 | 88 | 80 | 77 | 88 |

CATEGORY 13- WATERPROOFING MASTICS-ELASTOMERS

| | W.F. | 2 | 3 | 4 | 6 | 7 | JFN11 |
|-------------------|------|----|----|----|----|----|-------|
| 1. Stability | 10 | 10 | 10 | 10 | 10 | 10 | 5 |
| 2. Ponding Water | 10 | 10 | 10 | 10 | 10 | 10 | 5 |
| 3. Humidity | 10 | 10 | 10 | 10 | 10 | 6 | 10 |
| 4. Adhesion | 10 | 10 | 8 | 8 | 8 | 8 | 10 |
| 5. Acc. Weath. | 10 | 5 | 5 | 5 | 5 | 5 | 10 |
| 6. Elongation | 10 | 0 | 0 | 0 | 0 | 10 | 10 |
| 7. Tens. Strength | 10 | 5 | 2 | 0 | 0 | 0 | 5 |
| 8. Alkali Res. | 10 | 10 | 10 | 10 | 10 | 10 | 10 |

| | | | | | | |
|-----|---|---|---|---|-----|---|
| VOC | C | C | C | C | N/C | C |
|-----|---|---|---|---|-----|---|

| | | | | | | | |
|-------|----|----|----|----|----|----|----|
| Other | 20 | 15 | 15 | 10 | 15 | 15 | 15 |
|-------|----|----|----|----|----|----|----|

| | | | | | | | |
|-------|-----|----|----|----|----|----|----|
| TOTAL | 100 | 75 | 70 | 63 | 68 | 74 | 80 |
|-------|-----|----|----|----|----|----|----|

| | |
|----------------|---------|
| Elongation | 200% |
| Tens. Strength | 200 psi |

CATEGORY 14- WATERPROOFING SEALERS

| | W.F. | 1 | 2 | 3 | 4 | 6 | 7 | 9 | 10 | JFN10 |
|--------------------------|------|----|----|----|----|----|----|----|----|-------|
| 1. Stability | 10 | 8 | 10 | 10 | 10 | 10 | 10 | 9 | 5 | 0 |
| 2. Humidity | 15 | 8 | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 10 |
| 3. Adhesion | 10 | 10 | 10 | 10 | 10 | 10 | 8 | 10 | 10 | 10 |
| 4. Application | 10 | 10 | 10 | 10 | 10 | 10 | 5 | 10 | 10 | 10 |
| 5. Acc. Weath. | 15 | 15 | 15 | 15 | 15 | 15 | 15 | 15 | 15 | 15 |
| 6. H ₂ O Rep. | 15 | 5 | 5 | 10 | 5 | 15 | 15 | 15 | 10 | 10 |
| 7. Alkali Res. | 10 | 10 | 0 | 0 | 0 | 0 | 10 | 10 | 8 | 10 |

VOC C N/C N/C N/C N/C N/C N/C N/C C

| | | | | | | | | | | |
|-------|----|----|----|----|----|----|----|----|----|----|
| Other | 15 | 10 | 15 | 15 | 15 | 10 | 15 | 10 | 15 | 10 |
|-------|----|----|----|----|----|----|----|----|----|----|

| | | | | | | | | | | |
|-------|-----|----|----|----|----|----|----|----|----|----|
| TOTAL | 100 | 76 | 75 | 80 | 75 | 80 | 88 | 89 | 83 | 75 |
|-------|-----|----|----|----|----|----|----|----|----|----|

9. TEST PROCEDURES

ASTM D2369
ASTM D1475
ASTM D2196
ASTM D1729
ASTM D1364 and ASTM D3792
ASTM D1849
ASTM D1849
ASTM D2243
ASTM D1640
ASTM D3363
STD 141B FTM 6216
STD 141B FTM 6321
ASTM D523

STD 141B 6131
ASTM D2247
ASTM D3359

ASTM D4060
ASTM D1737
ASTM D2794

STD 141 FTM 4494
ASTM D2801
ASTM D2805
ASTM G23, D822
ASTM B117
ASTM D2370
ASTM D2370

ASTM D2921
STD 141B FTM TTC555
ASTM D3273 and ASTM D3274
ASTM D3960, 10.2.3

1. Total Non-Volatile (% Wt.)
2. Specific Gravity (Lbs/Gallon)
3. Viscosity, Cps, Brookfield
4. Color
5. % Water (Wt.)
6. Stability 77°F
7. Stability 120°F
8. Freeze-Thaw Resistance
9. Drytime
10. Hardness
11. Block Resistance
12. Sanding Properties
13. 60° Gloss
14. Ponding H₂O Resistance (a)
15. Yellowness Index
16. Humidity Resistance
17. Adhesion
18. Enamel Holdout (b)
19. H₂O Cleanup
20. Abrasion Resistance
21. Flexibility
22. Impact Resistance
23. Appearance (c)
24. Application Properties (d)
25. Sag Resistance
26. Levelling
27. Contrast Ratio
28. Accelerated Weathering
29. Salt Spray Resistance
30. Elongation
31. Tensile Strength
32. Bleed Resistance (e)
33. H₂O Repellancy
34. Alkali Resistance
35. Fungus Resistance
36. Volatile Organic Content (VOC)

Note: Items 19, 23, 24, 32 are qualitative tests. Item 14 and 18 run as described.

a). Ponding water resistance: cured 25 mil D.F.T. sealed freefilm to metal cylinder 25 cm² surface area, 100 gms H₂O, Wt. loss monitored each 24 hrs.

b). Enamel Holdout: ratio of 60° gloss of TT489 enamel over paint vs sealed Moresst Chart.

c). Subjective aesthetic evaluation

d). Application properties: includes brush, roller, spray (airless, conventional) as applicable.

e). Bleed Resistance: redwood panel, 3 mil wet film, humidity cabinet, 100°F, 100% RH 72 Hrs, visual rating.

ASTM D3792 was performed using whole sample headspace gas/liquid chromatography

10. TEST PROTOCOL

The following table represents the specific tests performed on each sample within the fourteen (14) categories.

TABLE 2

CATEGORY

| <u>TESTS</u> | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 |
|-----------------------------------|---|---|-----|---|------------------|---|-------|---|---|----------|----|----|----|----|
| 1. Total NV % Wt. | x | x | x | x | x | x | x | x | x | x | x | x | x | x |
| 2. Spec. Gravity | x | x | x | x | x | x | x | x | x | x | x | x | x | x |
| 3. Viscosity Cps | x | x | x | x | x | x | x | x | x | x | x | x | x | x |
| 4. Color | x | | | | x | | | | | | | | | x |
| 5. % Water | x | x | x | x | x | x | x | x | x | x | x | x | x | x |
| 6. Stability 77°F | x | x | x | x | x | x | x | x | x | x | x | x | x | x |
| 7. Stability 120°F | x | x | x | x | x | x | x | x | x | x | x | x | x | x |
| 8. Freeze-Thaw Res. | | | All | | H ₂ O | | Based | | | Products | | | | |
| 9. Dry Time | x | x | x | x | x | x | x | x | x | x | x | x | x | x |
| 10. Hardness | | x | x | x | x | | | x | | x | | x | | |
| 11. Block Res. | | | | | x | | | x | | | | x | | |
| 12. Sanding Prop. | | | | | x | | | | | x | | x | | |
| 13. 60° Gloss | | | | x | x | | | x | | | | | | |
| 14. Ponding H ₂ O Res. | | | | | | | | | x | | | | x | |
| 15. Yellowness Index | | | | x | x | | | x | | | | | | |
| 16. Humidity Res. | | x | x | x | x | x | x | x | x | x | x | x | x | x |
| 17. Adhesion | x | x | x | x | x | x | x | x | x | x | x | x | x | x |
| 18. En. Holdout (S.S.) | | x | x | | | | | | | x | x | x | | |
| 19. H ₂ O Cleanup | | | All | | H ₂ O | | Based | | | Products | | | | |
| 20. Abrasion Res. | | | | x | x | | | x | | | | | | |
| 21. Flexibility | | x | x | x | x | x | x | x | x | x | x | x | x | |
| 22. Impact Res. | | x | x | x | x | | | x | x | | | | x | |
| 23. Appearance | x | x | x | x | x | x | x | x | x | x | x | x | x | x |
| 24. App. Properties | x | x | x | x | x | x | x | x | x | x | x | x | x | x |
| 25. Sag Res. | | x | x | x | x | | | x | | x | x | x | x | |
| 26. Levelling | | x | x | x | x | | | x | | x | x | x | x | |
| 27. Contrast Ratio | | | | x | x | x | x | x | | | | | x | |
| 28. Acc. Weathering | x | | | x | x | x | x | x | x | | | | x | x |
| 29. Salt Spray Res. | | | x | x | x | | | x | | x | | | | |
| 30. Elongation | | | | | | | | | x | | | | x | |
| 31. Tensile Strength | | | | | | | | | x | | | | x | |
| 32. Bleed Res. | | x | | | | x | | | | x | x | x | | |
| 33. H ₂ O Repellancy | | | | | | x | x | | | | | | | x |
| 34. Alkali Res. | x | | | | | | | | | x | x | x | x | x |
| 35. Fungus Res. | | | | | | | x | | | | | | | |
| 36. Moisture Retention | x | | | | | | | | | | | | | |
| 37. Grain Raising | | x | | | x | x | x | | | | | x | | |
| 38. VOC | x | x | x | x | x | x | x | x | x | x | x | x | x | x |

A. V.O.C.

In order to calculate V.O.C., certain tests must be performed including:

1. Total Non Volatile
2. Specific Gravity
5. % Water
38. G.C. Analysis for Exempt Solvents (Chlorinated Hydrocarbons)

B. Stability

Tests such as:

3. Viscosity - initial
6. Stability 77°F
7. Stability 120°F

monitor viscosity changes with aging of the coating in the container and provide information with respect to application properties and modes of application.

C. Waterbased Only

Waterbased products only are tested for:

8. Freeze Thaw Resistance
19. Water-Cleanup of Application Tools

D. All Coatings

Tests applicable to all coatings include:

9. Drytime
17. Adhesion- to specific use substrate
23. Appearance
24. Application Properties

E. Water Resistance

Water resistance properties of the cured film include:

14. Ponding Water resistance- Roof Coatings
16. Humidity Resistance
17. Salt Spray Resistance
33. Water Repellancy

F. Dried Film Properties

Physical property tests of the dried film include:

- 4. Color
- 10. Hardness
- 13. 60° Gloss
- 20. Abrasion Resistance
- 21. Flexibility
- 22. Impact Resistance
- 27. Contrast Ratio- Hiding Power
- 30. Elongation
- 31. Tensile Strength

G. Wet Film Properties

- 25. Sag Resistance
- 26. Levelling

H. Other specialty tests required for specific end use include:

- 11. Block Resistance (adhesion of coatings when stacked)
- 12. Sanding Properties
- 18. Enamel Holdout (primers and undercoats)
- 28. Accelerated U.V. Resistance
- 32. Bleed Resistance (to substrata components or contaminants)
- 34. Alkali Resistance
- 35. Fungus Resistance
- 36. Moisture Retention (concrete curatives)
- 37. Grain Raising (for wood coatings)

11. TEST CONDITIONS

The following conditions relate to tests cited in the Test Protocol.

| | |
|-----------------------------------|---|
| 1. Total NV % Wt. | 100°C, 2 Hrs |
| 2. Spec. Gravity | Weight/gallon cup, 77°F |
| 3. Viscosity Cps | Brookfield RVT (spindle, speed) |
| 4. Color | |
| 5. % Water | Karl Fischer |
| 6. Stability 77°F | 5 months, 3/4 full pint |
| 7. Stability 120°F | 30 days, 3/4 full pint |
| 8. Freeze-Thaw Res. | 3 cycles, 16 hrs, 20°F, 8 Hrs 77°F |
| 9. Drytime | Gardner Circular Drytime Recorder |
| 10. Hardness | Pencil, 7 day cure, 77°F |
| 11. Block Res. | |
| 12. Sanding Prop. | 24 Hrs dry, 120 grit, ponderosa pine |
| 13. 60° Gloss | 48 Hrs dry |
| 14. Ponding H ₂ O Res. | 7 day cure, 25 mil D.F.T. |
| 15. Yellowness Index | |
| 16. Humidity Res. | 48 Hrs cure, 48 Hrs exposure, 100°F, 100% R.H. |
| 17. Adhesion | Crosshatch, Tape |
| 18. En. Holdout (S.S.) | 48 Hr cure, 3 mil wet (a) |
| 19. H ₂ O Cleanup | |
| 20. Abrasion Res. | 48 Hrs cure, 1000 gms, CS10, 1000 rev. |
| 21. Flexibility | Cylindrical mandrel |
| 22. Impact Res. | Forward |
| 23. Appearance | |
| 24. Appl. Properties | Brush, roller, spray (b) |
| 25. Sag Res. | |
| 26. Levelling | |
| 27. Contrast Ratio | 3 mil wet film |
| 28. Acc. Weathering | ASTM G23 Type D, Twin Carbon Arc, 300 Hrs |
| 29. Salt Spray Res. | 200 Hrs, 5% NaCl, Bonderite 1000 Panels |
| 30. Elongation | 1 week cure + 4 hrs. 120°F, 25 mils DFT (c) |
| 31. Tensile Strength | 1 week cure + 4 hrs. 120°F, 25 mils DFT (c) |
| 32. Bleed Res. | 72 Hrs humidity cabinet 100°F, 100% RH |
| 33. H ₂ O Repellancy | 7 day cure (d) |
| 34. Alkali Res. | 5% NaOH, 48 Hrs |
| 35. Fungus Res. | 16 day exposure |
| 36. Moisture Retention | ASTM C156, surface area 48 sq. in. |
| 37. Grain Raising | Ponderosa pine panels |
| 38. VOC | G.C. Headspace Analysis |

a). Enamel Holdout: ratio of 60° gloss of TT489 enamel over paint vs sealed Morest chart.

b). Application properties: includes brush, roller, spray (airless, conventional) as applicable.

c). Tensile/Elongation: 1" x 3" specimen, C.H. speed 1"/minute

d). H₂O Repellancy Evaluation

| <u>Rating</u> | <u>Explanation</u> |
|---------------|---|
| Excellent | Beads water longer than 2 1/2 hrs. |
| Good | Beads water between 2 and 2 1/2 hrs. |
| Fair | Beads water between 30 minutes and 2 hrs. |
| Poor | Beads water less than 30 minutes. |

12. APPENDICES

I. Definitions

The following definitions of categories are those of the California Air Resources Board:

(A). Architectural Coating- Any coating applied to stationary structures and their appurtenances, to mobile homes, to pavements, curbs, etc.

(B). Concrete Curing Compounds- Coatings with the sole purpose of retarding the evaporation of water from the surface of freshly cast concrete, thereby strengthening the concrete.

(C). General Undercoaters- Coatings which are designed to provide a smooth surface for subsequent coats.

(D). Industrial Maintenance Primers- Coatings which are intended to be applied to a surface prior to the application of an industrial maintenance topcoat to provide a firm bond between the substrate and subsequent coats.

(E). Industrial Maintenance Topcoats- High performance coatings which are formulated for the purpose of heavy abrasion, water immersion, chemical, corrosion, temperature, electrical, or solvent resistance.

(F). Lacquer- Clear or pigmented coatings formulated with nitrocellulose or synthetic resins to dry by evaporation without chemical reaction and to provide a quick drying, solid, protective film.

(G). Opaque Stains- Any stain that is not classified as a semi-transparent stain.

(H). Opaque Wood Preservatives- All wood preservatives not classified as semi-transparent wood preservatives.

(I). Photochemically Reactive Organic Compound (PROC)- Any compound containing at least one atom of carbon that is a gas or liquid at 70°F and 760 mm Hg, except methane, carbon monoxide, carbon dioxide, carbonic acid, metallic carbides or carbonates, dichloromethane, trichlorofluoromethane (CFC-11), dichlorodifluoromethane (CFC-12), chlorodifluoromethane (CFC-22), trifluoromethane (FC-23), 1,1,1-trichloroethane, tetrachloroethene (perchloroethylene), trichlorotrifluoroethane (CFC-113), dichlorotetrafluoroethane (CFC-114), and chloropentafluoroethane (CFC-115). Most organic solvents used in architectural coatings are comprised entirely of PROCs.

(J). Quick Dry Enamels - Non-flat coatings which:

1. Are capable of being applied directly from the container by brush or roller under normal conditions, normal conditions, ie: ambient temperatures between 60°F and 80°F and

2. When tested in accordance with ASTM D 1640, set to touch in two hours or less, dry hard in eight hours or less, and are tack free in four hours or less by the mechanical method test; and

3. Have a 60° dried film gloss of no less than 70.

(K). Roof Coatings- Coatings that are formulated for the sole purpose of preventing penetration of a roof substrate by water.

(L). Specialty Primers, Sealers, and Undercoaters- Primers, sealers, and undercoaters used only to perform one of the following functions; repair fire, smoke, or water damage; neutralize odor; block stains, block efflorescence; condition chalky surfaces; or coat acoustical materials without affecting their acoustical abilities.

(M). Waterproofing Mastic Coatings- Weatherproof and waterproof coatings which are formulated to cover holes and minor cracks and to conceal surface irregularities, and which are to be applied in thicknesses of at least 15 mils.

(N). Waterproofing Sealers- Coatings which are formulated for the sole purpose of protecting porous substrates by preventing the penetration of water.

II. Product Information Supplied With Sample

| Category # | Sample # | Substrate | Spreading Rate sq. ft./gal. |
|------------|----------|------------------|--------------------------------|
| 1 | 13-1 | Uncured Concrete | 200 to 300 |
| 1 | 13-3A/B | Uncured Concrete | 250 to 400 |
| 1 | 13-4 | Uncured Concrete | 200 to 300 |
| 1 | 13-5 | Uncured Concrete | 200 to 300 |
| 1 | 13-6 | Uncured Concrete | 200 to 300 |
| 1 | 13-7 | Uncured Concrete | 200 |
| 1 | 13-8 | Uncured Concrete | 100 |
| 1 | 13-9 | Uncured Concrete | 200 to 300 |
| 1 | 13-10 | Uncured Concrete | 200 to 300 |
| 1 | JFN #3 | Uncured Concrete | 200 |
| 2 | 14-1 | Concrete | |
| 2 | 14-2 | Concrete | |
| 2 | 14-3 | Concrete | |
| 2 | JFN #12 | Masonry | Floodcoat |
| 3A | JFN #1 | Steel | 300 to 400 |
| 3B | 16-9 | Steel | |
| 3B | 16-10 | Steel | |
| 3B | 16-1 | Steel | |
| 3C | 17-1 | Steel | 55 to 60 |
| 3C | 17-2 | Steel | 55 to 60 |
| 3C | 17-3 | Steel | 55 to 60 |
| 4 | JFN #2 | Wood, Al., Steel | 800 to 1000 |
| 4 | JFN #7 | Brick | |
| 4 | 19-1 | Primed Steel | |
| 4 | 19-2 | Primed Steel | |
| 4 | 19-3 | Primed Steel | |
| 4 | 19-4 | Primed Steel | |
| 4 | 19-5 | Primed Steel | |
| 4 | 19-6 | Primed Steel | |
| 4 | 20-1 | Primed Steel | |
| 5 | 21-1 | | |
| 5 | 21-2 | | 500 |
| 5 | 21-3 | Wood | 500 |
| 5 | 21-4 | | |
| 5 | JFN #5 | Wood | 300 to 400 |

| Category # | Sample # | Substrate | Spreading Rate sq. ft./gal. |
|------------|----------|------------------|--------------------------------|
| 6 | 22-1 | Wood | 200 to 300 |
| 6 | 22-2 | Wood | |
| 6 | 22-3 | Wood | 350 to 400 |
| 6 | 22-4 | Wood | 300 to 400 |
| 6 | 22-5 | Wood | 100 to 500 |
| 6 | 22-6 | Wood | 200 to 500 |
| 6 | 22-7 | Wood | 200 to 500 |
| 6 | 22-8 | Wood | 150 to 250 |
| 6 | 22-9 | Wood | |
| 6 | JFN #6 | Wood | |
| 6 | JFN #8 | Cement, Asphalt | |
| 7 | 23-1 | Wood | |
| 7 | 23-2 | Wood | |
| 7 | 23-3 | Rough Wood | 100 to 300 |
| 7 | JFN #13 | Wood | 150 to 300 |
| 8 | 24-2 | | 250 to 400 |
| 8 | 24-4 | | |
| 8 | 24-6 | | 400 to 500 |
| 8 | 24-7 | | 600 |
| 8 | 24-8 | | 500 to 600 |
| 8 | 24-10 | Metal | 250 to 400 |
| 9 | 25-1 | | |
| 9 | 25-2 | | |
| 9 | 25-3 | | |
| 9 | 25-4 | | |
| 9 | 25-5 | | |
| 9 | 25-6 | | 100 |
| 10 | 26-1 | | |
| 10 | 26-2 | Stucco, Concrete | |
| 10 | 26-3 | Chalky Surfaces | |
| 10 | 26-4 | | |
| 10 | 26-5 | | |
| 10 | 26-6 | | |
| 11 | 27-2 | | |
| 11 | 27-3 | Concrete | 150 to 300 |
| 11 | 27-4 | Wood | 200 to 400 |
| 11 | 27-5 | | |
| 11 | 27-6 | Asphalt | 350 to 400 |
| 11 | 27-7 | Wood | 200 |

| Category # | Sample # | Substrate | Spreading Rate sq. ft./gal |
|------------|----------|---------------------|-------------------------------|
| 12 | 28-1 | | |
| 12 | 28-2 | Rough Concrete | 200 to 300 |
| 12 | 28-3 | Dry Wall or Plaster | 400 |
| 12 | 28-4 | Rough Concrete | 200 |
| 12 | 28-5 | Wood | 200 |
| 12 | 28-6 | Masonry | |
| 13 | 29-2 | Concrete and Steel | 12.5 |
| 13 | 29-3 | Concrete and Steel | |
| 13 | 29-4 | Concrete and Steel | |
| 13 | 20-6 | Concrete and Steel | 12.5 |
| 13 | 29-7 | Concrete and Steel | 10 |
| 13 | JFN #11 | Masonry | 33 |
| 14 | 30-1 | | |
| 14 | 30-2 | Rough Concrete | 200 |
| 14 | 30-3 | Rough Concrete | 75 to 150 |
| 14 | 30-4 | Rough Concrete | 150 to 300 |
| 14 | 30-6 | | 100 to 200 |
| 14 | 30-7 | | 75 to 150 |
| 14 | 30-9 | Rough Concrete | 50 to 100 |
| 14 | 30-10 | Rough Concrete | 50 to 100 |
| 14 | JFN #10 | Concrete Block | 75 |

III. Laboratory Data Sheets

LABORATORY REPORT FORM

Contract # A4 166 48

Sample No. RDA -II-13-1
 Contract No. A5 097 48
 Date received: 3/13/86
 Log No.: 313-1A-1C
 Lab code: CCl
 Quantity: 1 Pt./2 Qts.
 Test initiated: 3/14/86
 Test completed: 12/86

Chemist: L. Kudela

Product Category: 1. Concrete Curing Compound

| Tests | Procedure | Results |
|--|----------------|--------------------------------|
| 1. Total NV % Wt. | ASTM D2369 | 12.36% |
| 2. Wt. per Gallon | ASTM D1475 | 6.72 |
| 3. Viscosity Cps (Brookfield) | ASTM D2196 | 24 cp #1 (50,100) |
| 4. Color | ASTM D1729 | #1 |
| 5. % Water | ASTM D1364 | 1.01% |
| 6. Stability 77°F 5 months | ASTM D1849 | 20.3 cp#1 (50,100) |
| 7. Stability 120°F | ASTM D1849 | 19.5 cp#1 (50,100) |
| 8. Freeze - Thaw Res. (All H ₂ O Based Products) | ASTM D2243 | N/A |
| 9. Dry Time | ASTM D1640 | STT: 5 min. |
| 10. Adhesion | ASTM D3359 | DH: 19 min. (on metal) |
| 11. H ₂ O Cleanup | --- | 5 (concr.) |
| 12. Appearance | --- | Oil based |
| 13. Application Properties | --- | Smooth on concrete |
| 14. Acc. Weathering | ASTM G23, D822 | * Sprays satisf. |
| 15. Alkali Res. TD 141B FTM TTC555 | | Pass |
| 16. VOC | | Pass |
| 17. Moisture Retention | ASTM C156 | 698.02 |
| | | 0.216 kg/m ² 24hrs. |

*Airless and conventional

Note: Items 11, 12, 13 are qualitative tests.

Application properties: includes brush, roller, spray
 (airless, conventional) as applicable.

LABORATORY REPORT FORM

Contract # A4 166 48

Sample No. RDA -II-13-3A, 3B
 Contract No. A5 097 48
 Date received: 3/28/86
 Log No.: 328 1A-1C
 Lab code: CC3
 Quantity: 1 Pt./2 Qts.
 Test initiated: 4/4/86
 Test completed: 12/86

Chemist: L. Kudela

Product Category: 1. Concrete Curing Compound

| Tests | Procedure | Results |
|--|--------------------|---|
| 1. Total NV % Wt. | ASTM D2369 | <u>73.55</u> |
| 2. Wt. per Gallon | ASTM D1475 | <u>9.57</u> |
| 3. Viscosity Cps (Brookfield) | ASTM D2196 | <u>404 cp #2 (20,50) Mixed</u> <u>10 min. after prep</u> |
| 4. Color | ASTM D1729 | <u>>#18-ASTM D 1544</u> |
| 5. % Water | ASTM D1364 | <u>0.17%</u> |
| 6. Stability 77°F | ASTM D1849 | <u>618 cp#2 (20,50)</u> |
| 7. Stability 120°F | ASTM D1849 | <u>734 cp #2(20,50)</u> |
| 8. Freeze - Thaw Res. (All H ₂ O Based Products) | ASTM D2243 | <u>N/A oil base</u> |
| 9. Dry Time | ASTM D1640 | STT: 22 min. DH: 70 min. (on metal) |
| 10. Adhesion | ASTM D3359 | <u>5</u> |
| 11. H ₂ O Cleanup | --- | <u>N/A oil base</u> |
| 12. Appearance | --- | <u>Smooth</u> |
| 13. Application Properties | --- | * <u>Spray/brush-good</u> |
| 14. Acc. Weathering | ASTM G23, D822 | <u>Failed</u> |
| 15. Alkali Res. | TD 141B FTM TTC555 | <u>Pass (48 hrs)</u> |
| 16. VOC | | <u>303.49</u> |
| 17. Moisture Retention | ASTM C156 | <u>0.123 kg/m² 24 hrs.</u> |
| 18. Pot Life | | <u>105 min.</u> |

*Airless and conventional

Note: Items 11, 12, 13 are qualitative tests.

Application properties: includes brush, roller, spray
 (airless, conventional) as applicable.

LABORATORY REPORT FORM

Contract # A4 166 48

Sample No. RDA -II-13-4
 Contract No. A5 097 48
 Date received: 4/10/86
 Log No.: 410 1A-1C
 Lab code: CC4
 Quantity: 1 Pt./2 Qts.
 Test initiated: 4/11/86
 Test completed: 12/86

Chemist: L. Kudela

Product Category: 1. Concrete Curing Compound

| Tests | Procedure | Results |
|--|--------------------|--|
| 1. Total NV % Wt. | ASTM D2369 | 11.77 |
| 2. Wt. per Gallon | ASTM D1475 | 8.37 |
| 3. Viscosity Cps (Brookfield) | ASTM D2196 | 12.1 cp #1 (50,100) |
| 4. Color | ASTM D1729 | N/A |
| 5. % Water | ASTM D1364 | 85.69 |
| 6. Stability 77°F | ASTM D1849 | 13.3 cp #1 (50,100) |
| 7. Stability 120°F | ASTM D1849 | * 11.1 cp #1 (50,100) |
| 8. Freeze - Thaw Res. (All H ₂ O Based Products) | ASTM D2243 | 12.8 cp #1 (50,100) |
| 9. Dry Time | ASTM D1640 | STT: 3 min. DH: 11 min. (cured concrete) |
| 10. Adhesion | ASTM D3359 | 4 (concrete) |
| 11. H ₂ O Cleanup | --- | Easy |
| 12. Appearance | --- | Smooth |
| 13. Application Properties | --- | Spray satisf |
| 14. Acc. Weathering | ASTM G23, D822 | Pass |
| 15. Alkali Res. | TD 141B FTM TTC555 | Failed-48 hrs |
| 16. VOC | | 1. 25.50 2. 178.19 |
| 17. Moisture Retention | ASTM C156 | 0.742 kg/m ² 24 hrs. |

*Resin Kickout and settling

Note: Items 11, 12, 13 are qualitative tests.

Application properties: includes brush, roller, spray
 (airless, conventional) as applicable.

LABORATORY REPORT FORM

Contract # A4 166 48

Sample No. RDA -II-13-5

Contract No. A5 097 48

Date received: 4/10/86

Chemist: L. Kudela

Log No.: 410 2A-2C

Lab code: CC5

Quantity: 1 Pt./2 Qts.

Test initiated: 4/11/86

Test completed: 12/86

Product Category: 1. Concrete Curing Compound

| Tests | Procedure | Results |
|--|--------------------|--------------------------------|
| 1. Total NV % Wt. | ASTM D2369 | 42.96 |
| 2. Wt. per Gallon | ASTM D1475 | 8.06 |
| 3. Viscosity Cps (Brookfield) | ASTM D2196 | 125 cp #2 (50,100) |
| 4. Color | ASTM D1729 | N/A (white pigmented) |
| 5. % Water | ASTM D1364 | 0.31% |
| 6. Stability 77°F | ASTM D1849 | 50.8 cp #2 (50,100) |
| 7. Stability 120°F | ASTM D1849 | 62 cp #2 (50,100) |
| 8. Freeze - Thaw Res. (All H ₂ O Based Products) | ASTM D2243 | Solvent base |
| 9. Dry Time | ASTM D1640 | STT: 65 min. DH: >48 hrs |
| 10. Adhesion | ASTM D3359 | 3 |
| 11. H ₂ O Cleanup | --- | N/A |
| 12. Appearance | --- | Smooth |
| 13. Application Properties | --- | Brush, spray-good |
| 14. Acc. Weathering | ASTM G23, D822 | Pass |
| 15. Alkali Res. | TD 141B FTM TTC555 | Pass-48hrs. |
| 16. VOC | | 551.22 |
| 17. Moisture Retention | ASTM C156 | 0.247 kg/m ² 24hrs. |

Note: Items 11, 12, 13 are qualitative tests.

Application properties: includes brush, roller, spray
(airless, conventional) as applicable.

LABORATORY REPORT FORM

Contract # A4 166 48

Sample No. RDA -II-13-6
 Contract No. A5 097 48
 Date received: 4/25/86
 Log No.: 425 1A-1C
 Lab code: CC6
 Quantity: 1 Pt./2 Qts.
 Test initiated: 4/28/86
 Test completed: 12/86

Chemist: L. Kudela

Product Category: 1. Concrete Curing Compound

| Tests | Procedure | Results |
|--|----------------|--------------------------------|
| 1. Total NV % Wt. | ASTM D2369 | 23.93% |
| 2. Wt. per Gallon | ASTM D1475 | 6.88 |
| 3. Viscosity Cps (Brookfield) | ASTM D2196 | 76.9 cp#1 (50,100) |
| 4. Color | ASTM D1729 | >18 ASTM D 1544 |
| 5. % Water | ASTM D1364 | <0.1% |
| 6. Stability 77°F | ASTM D1849 | 34.9 cp#1 (50,100) |
| 7. Stability 120°F | ASTM D1849 | 36 cp#1 (50,100) |
| 8. Freeze - Thaw Res. (All H ₂ O Based Products) | ASTM D2243 | N/A solvent based |
| 9. Dry Time | ASTM D1640 | STT: 105 min. |
| 10. Adhesion | ASTM D3359 | DH:>6 hrs. |
| 11. H ₂ O Cleanup | --- | 3 |
| 12. Appearance | --- | Oil based |
| 13. Application Properties | --- | Smooth |
| 14. Acc. Weathering | ASTM G23, D822 | Spray, brushing-good |
| 15. Alkali Res. TD 141B FTM TTC555 | | Pass |
| 16. VOC | | Pass |
| 17. Moisture Retention | ASTM C156 | 627.51 |
| | | 0.247 kg/m ² 24hrs. |

Note: Items 11, 12, 13 are qualitative tests.

Application properties: includes brush, roller, spray
 (airless, conventional) as applicable.

LABORATORY REPORT FORM

Contract # A4 166 48

Sample No. RDA -II-13-7
 Contract No. A5 097 48
 Date received: 4/30/86
 Log No.: 430 1A-1C
 Lab code: CC7
 Quantity: 1 Pt./2 Qts.
 Test initiated: 4/30/86
 Test completed: 12/86

Chemist: L. Kudela

Product Category: 1. Concrete Curing Compound

| Tests | Procedure | Results |
|--|--------------------|--|
| 1. Total NV % Wt. | ASTM D2369 | 51.35% |
| 2. Wt. per Gallon | ASTM D1475 | 8.05 |
| 3. Viscosity Cps (Brookfield) | ASTM D2196 | 71.3 cp #1 (50,100) |
| 4. Color | ASTM D1729 | N/A (pigmented) |
| 5. % Water | ASTM D1364 | < 0.1% |
| 6. Stability 77°F | ASTM D1849 | 84.5 cp #1 (50,100) |
| 7. Stability 120°F | ASTM D1849 | 76.8 cp #1 (50,100) |
| 8. Freeze - Thaw Res. (All H ₂ O Based Products) | ASTM D2243 | Oil based |
| 9. Dry Time | ASTM D1640 | STT: 148 min. |
| 10. Adhesion | ASTM D3359 | DH: >5 hrs. |
| 11. H ₂ O Cleanup | --- | 5 |
| 12. Appearance | --- | N/A Solvent based |
| 13. Application Properties | --- | Smooth on concrete |
| 14. Acc. Weathering | ASTM G23, D822 | Spray, brush-satisf |
| 15. Alkali Res. | TD 141B FTM TTC555 | Pass |
| 16. VOC | | Pass |
| 17. Moisture Retention | ASTM C156 | 469.56 0.185 kg/m ² 24hrs. |

Note: Items 11, 12, 13 are qualitative tests.

Application properties: includes brush, roller, spray
 (airless, conventional) as applicable.

LABORATORY REPORT FORM

Contract # A4 166 48

Sample No. RDA -II-13-8
 Contract No. A5 097 48
 Date received: 4/30/86
 Log No.: 430 2A-2C
 Lab code: CC8
 Quantity: 1 pt./2 qts.
 Test initiated: 8/11/86
 Test completed: 12/86

Chemist: L. Kudela

Product Category: 1. Concrete Curing Compound

| Tests | Procedure | Results |
|--|--------------------|-------------------------------|
| 1. Total NV % Wt. | ASTM D2369 | 10.84% |
| 2. Wt. per Gallon | ASTM D1475 | 9.78 |
| 3. Viscosity Cps (Brookfield) | ASTM D2196 | 16.8 cp #1 (50/100) |
| 4. Color | ASTM D1729 | #10 |
| 5. % Water | ASTM D1364 | 89.04 |
| 6. Stability 77°F | ASTM D1849 | 13.7 cp #1 (50.100) |
| 7. Stability 120°F | ASTM D1849 | 12.2 cp #1 (50.100) |
| 8. Freeze - Thaw Res. (All H ₂ O Based Products) | ASTM D2243 | 12.6 cp #1 (50.100) |
| 9. Dry Time | ASTM D1640 | STT: 4 min. |
| 10. Adhesion | ASTM D3359 | DH: 9 min. |
| 11. H ₂ O Cleanup | --- | 5 |
| 12. Appearance | --- | Easy |
| 13. Application Properties | --- | Smooth-on concrete |
| 14. Acc. Weathering | ASTM G23, D822 | Brush, spray-satisf. |
| 15. Alkali Res. | TD 141B FTM TTC555 | Pass |
| 16. VOC | | Failed-48hrs |
| 17. Moisture Retention | ASTM C156 | 1. 1.40 2. 0.80 |
| | | 0.99 kg/m ² 24hrs. |

Note: Items 11, 12, 13 are qualitative tests.

Application properties: includes brush, roller, spray
 (airless, conventional) as applicable.

LABORATORY REPORT FORM

Contract # A4 166 48

Sample No. RDA -II-13-9

Contract No. A5 097 48

Date received: 4/30/86

Chemist: L. Kudela

Log No.: 430 3A-3C

Lab code: CC9

Quantity: 1 pt./2 qts.

Test initiated: 8/11/86

Test completed: 12/86

Product Category: 1. Concrete Curing Compound

| Tests | Procedure | Results |
|--|--------------------|-------------------------------|
| 1. Total NV % Wt. | ASTM D2369 | 20.59% |
| 2. Wt. per Gallon | ASTM D1475 | 8.18 |
| 3. Viscosity Cps (Brookfield) | ASTM D2196 | 25.2 cp #1 (50/100) |
| 4. Color | ASTM D1729 | Tan-off white |
| 5. % Water | ASTM D1364 | 79.40% |
| 6. Stability 77°F | ASTM D1849 | 42.2 cp #1 (50/100) |
| 7. Stability 120°F | ASTM D1849 | 26 cp #1 (50,100) |
| 8. Freeze - Thaw Res. (All H ₂ O Based Products) | ASTM D2243 | 55.0 cp #1 (50/100) |
| 9. Dry Time | ASTM D1640 | STT: 12 min. DH: >3 hrs. |
| 10. Adhesion | ASTM D3359 | 5 |
| 11. H ₂ O Cleanup | --- | Easy |
| 12. Appearance | --- | Smooth (concrete) |
| 13. Application Properties | --- | Brush, spray-good |
| 14. Acc. Weathering | ASTM G23, D822 | Pass |
| 15. Alkali Res. | TD 141B FTM TTC555 | Failed-48hrs |
| 16. VOC | | 1. 0.10 2. 0.45 |
| 17. Moisture Retention | ASTM C156 | 0.773 kg/m ² 24hrs |

Note: Items 11, 12, 13 are qualitative tests.

Application properties: includes brush, roller, spray
(airless, conventional) as applicable.

LABORATORY REPORT FORM

Contract # A4 166 48

Sample No. RDA -II-13-10
 Contract No. A5 097 48
 Date received: 4/30/86
 Log No.: 430 4A-4C
 Lab code: CC10
 Quantity: 1pt./2 qts.
 Test initiated: 8/11/86
 Test completed: 12/86

Chemist: L. Kudela

Product Category: 1. Concrete Curing Compound

| Tests | Procedure | Results |
|--|--------------------|-------------------------------|
| 1. Total NV % Wt. | ASTM D2369 | 26.67% |
| 2. Wt. per Gallon | ASTM D1475 | 8.27 |
| 3. Viscosity Cps (Brookfield) | ASTM D2196 | 17.4 cp #1 (100/50) |
| 4. Color | ASTM D1729 | Off white |
| 5. % Water | ASTM D1364 | 72.9% |
| 6. Stability 77°F | ASTM D1849 | 16.2 cp #1 (50,100) |
| 7. Stability 120°F | ASTM D1849 | 17.5 cp #1 (50,100) |
| 8. Freeze - Thaw Res. (All H ₂ O Based Products) | ASTM D2243 | *28.2 cp #1 (50,100) |
| 9. Dry Time | ASTM D1640 | STT: 7 min. |
| 10. Adhesion | ASTM D3359 | DH: 35 min. |
| 11. H ₂ O Cleanup | --- | 5 |
| 12. Appearance | --- | Difficult |
| 13. Application Properties | --- | Smooth |
| 14. Acc. Weathering | ASTM G23, D822 | Brush, spray-good |
| 15. Alkali Res. | TD 141B FTM TTC555 | Pass |
| 16. VOC | | Failed-48 hrs |
| 17. Moisture Retention | ASTM C156 | 1. 4.27 2. 15.34 |
| | | 0.804 kg/m ² 24hrs |

*Thick skin

Note: Items 11, 12, 13 are qualitative tests.

Application properties: includes brush, roller, spray
 (airless, conventional) as applicable.

LABORATORY REPORT FORM

Contract # A4 166 48

Sample No. JFN #3
 Contract No. A5 097 48
 Date received: 7/11/86
 Log No.: 711 3A-3B
 Lab code: CC11
 Quantity: 2 qts.
 Test initiated: 7/15/86
 Test completed: 12/86

Chemist: L. Kudela

Product Category: 1. Concrete Curing Compound

| Tests | Procedure | Results |
|--|--------------------|-------------------------------|
| 1. Total NV % Wt. | ASTM D2369 | 20.16 |
| 2. Wt. per Gallon | ASTM D1475 | 8.57 |
| 3. Viscosity Cps (Brookfield) | ASTM D2196 | 16.4 (#1;50/100) |
| 4. Color | ASTM D1729 | White-translucent |
| 5. % Water | ASTM D1364 | 55.79 |
| 6. Stability 77°F | ASTM D1849 | 15.4 cp #1 (50,100) |
| 7. Stability 120°F | ASTM D1849 | 16.2 cp #1 (50,100) |
| 8. Freeze - Thaw Res. (All H ₂ O Based Products) | ASTM D2243 | Visc. n/a-gelled |
| 9. Dry Time | ASTM D1640 | STT: 2 min. |
| 10. Adhesion | ASTM D3359 | DH: 20 min. |
| 11. H ₂ O Cleanup | --- | 5 |
| 12. Appearance | --- | Easy |
| 13. Application Properties | --- | Smooth |
| 14. Acc. Weathering | ASTM G23, D822 | Brush, spray-good |
| 15. Alkali Res. | TD 141B FTM TTC555 | Pass no change |
| 16. VOC | | Failed-48 hrs |
| 17. Moisture Retention | ASTM C156 | 1. 247.13 2. 573.38 |
| | | 0.680 kg/m ² 24hrs |

Note: Items 11, 12, 13 are qualitative tests.

Application properties: includes brush, roller, spray
 (airless, conventional) as applicable.

LABORATORY REPORT FORM

Contract # A4 166 48

Sample No. RDA -II-14-1
 Contract No. A5 097 48
 Date received: 4/10/86
 Log No.: 410 4A-4C
 Lab code: GS2
 Quantity: 1 Pt./2 Qts.
 Test initiated: 4/10/86
 Test completed: 12/86

Chemist: R. Haffner

Product Category: 2. General Sealers

| Tests | Procedure | Results |
|--|------------|------------------------|
| 1. Total NV % Wt. | ASTM D2369 | 25.98 |
| 2. Wt. per Gallon | ASTM D1475 | 8.365 |
| 3. Viscosity Cps (Brookfield) | ASTM D2196 | 32.0 (1,100) |
| 4. % Water | ASTM D1364 | 72.49 |
| 5. Stability 77°F | ASTM D1849 | 32.0 (1,100) |
| 6. Stability 120°F | ASTM D1849 | 28.0 |
| 7. Freeze - Thaw Res. (1,100) (All H ₂ O Based Products) | ASTM D2243 | 33 Pass (1,100) |
| 8. Dry Time Concrete | ASTM D1640 | STT: 20 min. |
| 9. Hardness Q-panel | ASTM D3363 | DH: 1 hr. 30 min. |
| 10. Humidity Res. Concrete | ASTM D2247 | < HB |
| 11. Adhesion | ASTM D3359 | *See below |
| 12. En. Holdout (self sealing) | --- | 3 |
| 13. H ₂ O Cleanup (All H ₂ O Based Products) | --- | 0.83 |
| 14. Flexibility Q panel | ASTM D1737 | ** Fair-see below |
| 15. Impact Res. Q panel | ASTM D2794 | Passed 1" mandrel only |
| 16. Appearance | --- | 10 in. lbs. |
| 17. Application Properties | --- | Fair; appears smooth |
| 18. Sag Res. | ASTM D2801 | Translucent |
| 19. Levelling | ASTM D2801 | ***Good; brushing exc. |
| 20. Rust Stain Res. | --- | 0 mils |
| 21. VOC | | 10 |
| 22. Grain Raising | | Poor |
| 23. Recoatability | | 1. 16.81 2. 61.10 |
| | | Poor; left surface |
| | | rough on ponderosa pin |
| | | A. 5 B. 5 |

*Medium blisters-size 6- general
 **Leaves tacky residue if not cleaned immediately after use
 ***Produces a bronze discoloration on Q-panel after application within 15 minutes.

Note: Items 13, 16, 17 are qualitative tests. Item 12 run as described.
 a. Enamel Holdout: ratio of 60° gloss of TT489 enamel over paint vs sealed Morest chart.
 b. Application properties: includes brush, roller, spray (airless, conventional) as applicable.
 c. Recoatability: A. TTP19 B. TTE489

LABORATORY REPORT FORM

Contract # A4 166 48

Sample No. RDA -II-14-2
 Contract No. A5 097 48
 Date received: 4/10/86
 Log No.: 410 3A-3C
 Lab code: GS2
 Quantity: 1 Pt./2 Qts.
 Test initiated: 4/11/86
 Test completed: 12/86

Chemist: R. Haffner

Product Category: 2. General Sealers

| Tests | Procedure | Results |
|--|------------|---|
| 1. Total NV % Wt. | ASTM D2369 | 24.92 |
| 2. Wt. per Gallon | ASTM D1475 | 8.464 |
| 3. Viscosity Cps (Brookfield) | ASTM D2196 | 30.5 (1,100) |
| 4. % Water | ASTM D1364 | 73.94 |
| 5. Stability 77°F (brown skins) | ASTM D1849 | 30.5 (1,100) |
| 6. Stability 120°F | ASTM D1849 | 27.0 (1,100) |
| 7. Freeze - Thaw Res. (1,100) (All H ₂ O Based Products) | ASTM D2243 | 29 (1,100) |
| 8. Dry Time Concrete | ASTM D1640 | STT: 20 min. DH: 1 hr. 30 min. |
| 9. Hardness Concrete | ASTM D3363 | <HB |
| 10. Humidity Res. Concrete | ASTM D2247 | * see below |
| 11. Adhesion Q panel | ASTM D3359 | 1 |
| 12. En. Holdout (self sealing) | --- | 1.0 |
| 13. H ₂ O Cleanup (All H ₂ O Based Products) | --- | ** Fair |
| 14. Flexibility Q panel | ASTM D1737 | Pass > 1/8" mandrel |
| 15. Impact Res. Q panel | ASTM D2794 | 10.50 in/lbs |
| 16. Appearance | --- | *** Fair; smooth, translucent |
| 17. Application Properties (conv. spray) | --- | Brushing-concrete exc. |
| 18. Sag Res. | ASTM D2801 | 0 mils |
| 19. Levelling | ASTM D2801 | Flow 10 |
| 20. Rust Stain Res. | --- | Poor |
| 21. VOC | | 1. 12.71 2. 50.19 |
| 22. Grain Raising | | Poor; left surface rough on ponderosa pine |
| 23. Recoatability | | A. 5 B. 5 |

*Blisters medium-size 6- uniform over field

**Leaves tacky residue if not cleaned immediately after use

***Produces a bronze discoloration after application on Q-panel,
 within 10 minutes.

Note: Items 13, 16, 17 are qualitative tests. Item 12 run as described.

a. Enamel Holdout: ratio of 60° gloss of TT489 enamel
 over paint vs sealed Morest chart.

b. Application properties: includes brush, roller, spray
 (airless, conventional) as applicable.

c. Recoatability: A. TTP19 B. TTE489

LABORATORY REPORT FORM

Contract # A4 166 48

Sample No. RDA -II-14-3
 Contract No. A5 097 48
 Date received: 4/28/86
 Log No.: 428 1A-1C
 Lab code: GS2
 Quantity: 1 Pt./2 Qts.
 Test initiated: 4/28/86
 Test completed: 12/86

Chemist: R. Haffner

Product Category: 2. General Sealers

| <u>Tests</u> | <u>Procedure</u> | <u>Results</u> |
|---|------------------|---------------------------------|
| 1. Total NV % Wt. | ASTM D2369 | <u>43.99</u> |
| 2. Wt. per Gallon | ASTM D1475 | <u>8.279</u> |
| 3. Viscosity Cps (Brookfield) | ASTM D2196 | <u>37,600 cp (4,2.5)</u> |
| 4. % Water | ASTM D1364 | <u>54.68</u> |
| 5. Stability 77°F (some brn. skins) | ASTM D1849 | <u>37,600 (4,2.5)</u> |
| 6. Stability 120°F (some brn skins) | ASTM D1849 | <u>32,400 (4,2.5)</u> |
| 7. Freeze - Thaw Res. (All H ₂ O Based Products) | ASTM D2243 | <u>38,400 (4,2.5)</u> |
| 8. Dry Time | ASTM D1640 | <u>STT: 17 min.</u> |
| 9. Hardness Q-panel | ASTM D3363 | <u>DH: 45 min.</u> |
| 10. Humidity Res. Concrete brick | ASTM D2247 | <u><HB</u> |
| 11. Adhesion Concrete brick | ASTM D3359 | <u>Whitens; no blistering</u> |
| 12. En. Holdout (self sealing) | --- | <u>3</u> |
| 13. H ₂ O Cleanup (All H ₂ O Based Products) | --- | <u>1.13</u> |
| 14. Flexibility Q-panel | ASTM D1737 | <u>*good, cleans easily</u> |
| 15. Impact Res. Q-panel | ASTM D2794 | <u>1" mandrel</u> |
| 16. Appearance | --- | <u>84 inch lbs</u> |
| 17. Application Properties (brushed) | --- | <u>** Waxy</u> |
| 18. Sag Res. | ASTM D2801 | <u>Fair</u> |
| 19. Levelling | ASTM D2801 | <u>12; flow 0</u> |
| 20. Rust Stain Res. | --- | <u>4</u> |
| 21. VOC | | <u>Fair</u> |
| 22. Grain Raising (on ponderosa pine) | | <u>1. 14.12 2. 30.78</u> |
| 23. Recoatability | | <u>Poor, left surface rough</u> |
| | | <u>A. 0 B. 2</u> |

*But needs to be cleaned immediately after use

**Has very waxy feel when applied to wood. Has waxy feel and local stains Q-panels. Mild ammonia odor

Note: Items 13, 16, 17 are qualitative tests. Item 12 run as described.

a. Enamel Holdout: ratio of 60° gloss of TT489 enamel over paint vs sealed Morest chart.

b. Application properties: includes brush, roller, spray (airless, conventional) as applicable.

c. Recoatability: A. TTP19 B. TTE489

LABORATORY REPORT FORM

Contract # A4 166 48

Sample No. JFN #12
 Contract No. A5 097 48
 Date received: 9/10/86
 Log No.: 910-1B
 Lab code: GS2
 Quantity: 1 gal
 Test initiated: 9/10/86
 Test completed: 12/86

Chemist: R. Haffner

Product Category: 2. General Sealers

| Tests | Procedure | Results |
|---|------------|-----------------------|
| 1. Total NV % Wt. | ASTM D2369 | 45.19 |
| 2. Wt. per Gallon | ASTM D1475 | 8.44 |
| 3. Viscosity Cps (Brookfield) | ASTM D2196 | 98 (1,50) |
| 4. % Water | ASTM D1364 | 50.02 |
| 5. Stability 77°F | ASTM D1849 | 52 (1,50) 3 months |
| 6. Stability 120°F | ASTM D1849 | 51.6 (1,50) |
| 7. Freeze - Thaw Res. (All H ₂ O Based Products) | ASTM D2243 | 60.0 (1,50) |
| 8. Dry Time | ASTM D1640 | STT: 30 min. |
| 9. Hardness | ASTM D3363 | DH: 1 hr. 35 min. |
| 10. Humidity Res. (concrete) | ASTM D2247 | <HB |
| 11. Adhesion (concrete) | ASTM D3359 | *see below |
| 12. En. Holdout (self sealing) | --- | 5 |
| 13. H ₂ O Cleanup (All H ₂ O Based Products) | --- | 1.0 |
| 14. Flexibility | ASTM D1737 | **Excellent |
| 15. Impact Res. | ASTM D2794 | >1/8" mandrel |
| 16. Appearance | --- | >80.5 in. lbs. |
| 17. Application Properties | --- | *** Waxy, dries clear |
| 18. Sag Res. | ASTM D2801 | Good |
| 19. Levelling | ASTM D2801 | 0 mils |
| 20. Rust Stain Res. | --- | 10 |
| 21. VOC | | Fair |
| 22. Grain Raising | | 1. 48.47 2. 97.95 |
| 23. Recoatability | | Poor |
| | | A. 0 B. 0 |

*Slight Whitening-no blisters
 **Cleans very easily
 ***Strong ammonia odor

Note: Items 13, 16, 17 are qualitative tests. Item 12 run as described.

- Enamel Holdout: ratio of 60° gloss of TT489 enamel over paint vs sealed Mostest chart.
- Application properties: includes brush, roller, spray (airless, conventional) as applicable.
- Recoatability: A. TTP19 B. TTE489

LABORATORY REPORT FORM

Contract # A4 166 48

Sample No. RDA -II-16-1
 Contract No. A5 097 48
 Date received: 4/11/86
 Log No.: 411 1A-1C
 Lab code: 047-3B
 Quantity: 1 Pt./2 Qts.
 Test initiated: 4/14/86
 Test completed: 12/86

Chemist: A. Khan
R. Haffner

Product Category: 3. Industrial Maintenance Primers

| <u>Tests</u> | <u>Procedure</u> | <u>Results</u> |
|---|------------------|----------------------------------|
| 1. Total NV % Wt. | ASTM D2369 | 57.7 |
| 2. Wt. per Gallon | ASTM D1475 | 11.34 |
| 3. Viscosity Cps (Brookfield) | ASTM D2196 | 8800 (3,5) |
| 4. % Water | ASTM D1364 | 39.17% |
| 5. Stability 77°F | ASTM D1849 | 8800 (3,5) |
| 6. Stability 120°F | ASTM D1849 | * 8800 (3,5) |
| 7. Freeze - Thaw Res. (All H ₂ O Based Products) | ASTM D2243 | * 8800 (3,5) |
| 8. Dry Time | ASTM D1640 | STT: 28 min. DH: 38 min. |
| 9. Hardness | ASTM D3363 | HB |
| 10. Humidity Res. | ASTM D2247 | No blisters; very slight rust |
| 11. Adhesion | ASTM D3359 | 5 |
| 12. En. Holdout (self sealing) | --- | 1.20 |
| 13. H ₂ O Cleanup (All H ₂ O Based Products) | --- | Satisfactory |
| 14. Flexibility | ASTM D1737 | Passes 1/8" mandrel |
| 15. Impact Res. | ASTM D2794 | Passes 80 in. lbs. |
| 16. Appearance | --- | Smooth |
| 17. Application Properties | --- | **see not below |
| 18. Sag Res. | ASTM D2801 | > 12 |
| 19. Levelling | ASTM D2801 | 0 |
| 20. Salt Spray Res. | ASTM B117 | Fair-see attach |
| 21. VOC | | 1. 42.55 2. 90.28 |
| 22. Pot Life | | N/A |
| 23. Intercoat Adhesion | | A. 5 B. 5 |

Note: Items 13, 16, 17 are qualitative tests. Item 12 run as described.

a. Enamel Holdout: ratio of 60° gloss of TT489 enamel over paint vs sealed Moresst chart.

b. Application properties: includes brush, roller, spray (airless, conventional) as applicable.

c. Intercoat Adhesion: A. TTP19 B. TTE489

*No skin or sediment, mixes to smooth paste

**Sprayable upon 22-24% reduction, reduced with water

20. Salt Spray Resistance

| | Size | Frequency | Pattern | Extent of Corrosion |
|---------------|------|-----------|---|---|
| 1. Blistering | 6 | Medium | Uniform over field and at both scribes | -- |
| 2. Corrosion | -- | -- | Uniform at both scribes | 1/4" from each scribe some isolated field corrosion |

LABORATORY REPORT FORM

Contract # A4 166 48

Sample No. RDA -II-16-9
 Contract No. A5 097 48
 Date received: 3/18/86
 Log No.: 318 2A-2C
 Lab code: 016-3B-00
 Quantity: 1 Pt./2 Qts.
 Test initiated: 3/21/86
 Test completed: 12/86

Chemist: A. Khan
R. Haffner

Product Category: 3. Industrial Maintenance Primers

| <u>Tests</u> | <u>Procedure</u> | <u>Results</u> |
|---|------------------|---------------------------------|
| 1. Total NV % Wt. | ASTM D2369 | <u>52.30</u> |
| 2. Wt. per Gallon | ASTM D1475 | <u>10.60</u> |
| 3. Viscosity Cps (Brookfield) | ASTM D2196 | <u>1750.00 (3,20)</u> |
| 4. % Water | ASTM D1364 | <u>38.91</u> |
| 5. Stability 77°F | ASTM D1849 | <u>1713 (3,20)</u> |
| 6. Stability 120°F | ASTM D1849 | * <u>1725 (3,20)</u> |
| 7. Freeze - Thaw Res. (All H ₂ O Based Products) | ASTM D2243 | ** <u>1975 (3,20)</u> |
| 8. Dry Time | ASTM D1640 | STT: <u>23 min.</u> |
| 9. Hardness | ASTM D3363 | DH: <u>45 min.</u> |
| 10. Humidity Res. | ASTM D2247 | <u>HB</u> |
| 11. Adhesion | ASTM D3359 | <u>No blisters or rust</u> |
| 12. En. Holdout (self sealing) | --- | <u>4</u> |
| 13. H ₂ O Cleanup (All H ₂ O Based Products) | --- | <u>1.13</u> |
| 14. Flexibility | ASTM D1737 | <u>Good</u> |
| 15. Impact Res. | ASTM D2794 | <u>Passed 1/8"</u> |
| 16. Appearance | --- | <u>Passed 80 in. lbs.</u> |
| 17. Application Properties | --- | <u>Smooth finish</u> |
| 18. Sag Res. | ASTM D2801 | <u>Sprayable at 20% reduct.</u> |
| 19. Levelling | ASTM D2801 | <u>12</u> |
| 20. Salt Spray Res. | ASTM B117 | <u>0</u> |
| 21. VOC | | <u>Very Poor-see attached</u> |
| 22. Pot Life | | <u>1. 111.71 2. 220.98</u> |
| 23. Intercoat Adhesion | | <u>N/A</u> |
| | | <u>A. 4 B. 5</u> |

Note: Items 13, 16, 17 are qualitative tests. Item 12 run as described.

- a. Enamel Holdout: ratio of 60° gloss of TT489 enamel over paint vs sealed Morest chart.
- b. Application properties: includes brush, roller, spray (airless, conventional) as applicable.
- c. Intercoat Adhesion: A. TTP19 B. TTE489

* Slight settling of pigment

** Pigment settled but mixes to smooth paste

20. Salt Spray Resistance

| | Size | Frequency | Pattern | Extent of Corrosion |
|---------------|------|------------|---|--|
| 1. Blistering | 6 | Med. dense | Uniform over field and at both scribes | -- |
| 2. Corrosion | -- | -- | Uniform at both scribes, uniform over field | 1/2" from vertical scribe, 1/4" from cross-hatch |

LABORATORY REPORT FORM

Contract # A4 166 48

Sample No. RDA -II-16-10
 Contract No. A5 097 48
 Date received: 3/18/86
 Log No.: 318 1A-1C
 Lab code: 017-3B-00
 Quantity: 1 Pt./2 Qts.
 Test initiated: 3/21/86
 Test completed: 12/86

Chemist: A. Khan
R. Haffner

Product Category: 3. Industrial Maintenance Primers

| <u>Tests</u> | <u>Procedure</u> | <u>Results</u> |
|---|------------------|----------------------------|
| 1. Total NV % Wt. | ASTM D2369 | <u>56.78</u> |
| 2. Wt. per Gallon | ASTM D1475 | <u>11.02</u> |
| 3. Viscosity Cps (Brookfield) | ASTM D2196 | <u>1775 (3,20)</u> |
| 4. % Water | ASTM D1364 | <u>38.0</u> |
| 5. Stability 77°F | ASTM D1849 | <u>1760 (3,20)</u> |
| 6. Stability 120°F | ASTM D1849 | <u>* 1825 (3,20)</u> |
| 7. Freeze - Thaw Res. (All H ₂ O Based Products) | ASTM D2243 | <u>1950 (3,20)</u> |
| 8. Dry Time | ASTM D1640 | <u>STT: 18 min.</u> |
| 9. Hardness | ASTM D3363 | <u>DH: 30 min.</u> |
| 10. Humidity Res. | ASTM D2247 | <u>HB</u> |
| 11. Adhesion | ASTM D3359 | <u>No blisters or rust</u> |
| 12. En. Holdout (self sealing) | --- | <u>5</u> |
| 13. H ₂ O Cleanup (All H ₂ O Based Products) | --- | <u>0.94</u> |
| 14. Flexibility | ASTM D1737 | <u>Good</u> |
| 15. Impact Res. | ASTM D2794 | <u>Passed 1/8"</u> |
| 16. Appearance | --- | <u>Passed 80 in. lbs.</u> |
| 17. Application Properties | --- | <u>Smooth finish</u> |
| 18. Sag Res. | ASTM D2801 | <u>Sprayable at</u> |
| 19. Levelling | ASTM D2801 | <u>25% reduction</u> |
| 20. Salt Spray Res. | ASTM B117 | <u>12</u> |
| 21. VOC | | <u>0</u> |
| 22. Pot Life | | <u>Poor- see attached</u> |
| 23. Intercoat Adhesion | | <u>1. 68.97 2. 138.38</u> |
| | | <u>N/A</u> |
| | | <u>A. 5 B. 5</u> |

*Settled but mixable

Note: Items 13, 16, 17 are qualitative tests. Item 12 run as described.

- a. Enamel Holdout: ratio of 60° gloss of TT489 enamel over paint vs sealed Morest chart.
- b. Application properties: includes brush, roller, spray (airless, conventional) as applicable.
- c. Intercoat Adhesion: A. TTP19 B. TTE489

20. Salt Spray Resistance

| | Size | Frequency | Pattern | Extent of Corrosion |
|---------------|------|---------------|---|------------------------|
| 1. Blistering | 4 | Med. | Uniform at both scribes | -- |
| | 8 | Med. dense | Uniform over field | -- |
| 2. Corrosion | -- | -- | Uniform at both scribes, some isolated field corrosion | 1/8" from both scribes |
| | | | General fileform corrosion | |

LABORATORY REPORT FORM

Contract # A4 166 48

Sample No. RDA -II-17-1
 Contract No. A5 097 48
 Date received: 4/2/86
 Log No.: 42 1A-1C
 Lab code: 043-3C
 Quantity: 1 Pt./2 Qts.
 Test initiated: 4/3/86
 Test completed: 12/86

Chemist: A. Khan
R. Haffner

Product Category: 3. Industrial Maintenance Primers

| <u>Tests</u> | <u>Procedure</u> | <u>Results</u> |
|---|------------------|--|
| 1. Total NV % Wt. | ASTM D2369 | 58.7 |
| 2. Wt. per Gallon | ASTM D1475 | 10.67 |
| 3. Viscosity Cps (Brookfield) (5 spindle, 1 speed) | ASTM D2196 | 1.2×10^4 (5,20) |
| 4. % Water | ASTM D1364 | 38.50 |
| 5. Stability 77°F | ASTM D1849 | 1.2×10^4 (5,20) |
| 6. Stability 120°F | ASTM D1849 | 1.2×10^4 (5,20) |
| 7. Freeze - Thaw Res. (All H ₂ O Based Products) | ASTM D2243 | Reduction viscosity 9×10^3 (5,20) STT: 25 min. DH: 35 min. |
| 8. Dry Time | ASTM D1640 | HB |
| 9. Hardness | ASTM D3363 | No rust or blister |
| 10. Humidity Res. | ASTM D2247 | 1-2 |
| 11. Adhesion | ASTM D3359 | 0.97 |
| 12. En. Holdout (self sealing) | --- | Good |
| 13. H ₂ O Cleanup (All H ₂ O Based Products) | --- | |
| 14. Flexibility | ASTM D1737 | Passed 1/8" mandrel |
| 15. Impact Res. | ASTM D2794 | Passed 60 in. lbs. |
| 16. Appearance | --- | Smooth |
| 17. Application Properties | --- | *see below |
| 18. Sag Res. | ASTM D2801 | 12 |
| 19. Levelling | ASTM D2801 | 0 |
| 20. Salt Spray Res. | ASTM B117 | Very Poor-see attached |
| 21. VOC | | 1. 35.82 2. 70.08 |
| 22. Pot Life | | N/A |
| 23. Intercoat Adhesion | | A. 3 B. 5 |

*Sprayable at 3-40% reduction H₂O

Note: Items 13, 16, 17 are qualitative tests. Item 12 run as described.

- a. Enamel Holdout: ratio of 60° gloss of TT489 enamel over paint vs sealed Morest chart.
- b. Application properties: includes brush, roller, spray (airless, conventional) as applicable.
- c. Intercoat Adhesion: A. TTP19 B. TTE489

20. Salt Spray Resistance

| | Size | Frequency | Pattern | Extent of Corrosion |
|---------------|------|-----------|---|--|
| 1. Blistering | 6 | Med. | Uniform at both scribe, some random isolated blisters on field | -- |
| 2. Corrosion | -- | -- | Uniform at both scribe, some random isolated field corrosion General file form corrosion | 1/4" from vertical scribe, 3/4" from cross-hatch |

LABORATORY REPORT FORM

Contract # A4 166 48

Sample No. RDA -II-17-2
Contract No. A5 097 48
Date received: 4/16/86
Log No.: 416 1A-1C
Lab code: 049-3C
Quantity: 1 Pt./2 Qts.
Test initiated: 4/21/86
Test completed: 12/86

Chemist: A. Khan
R. Haffner

Product Category: 3. Industrial Maintenance Primers

| Tests | Procedure | Results |
|---|------------|---------------------|
| 1. Total NV % Wt. | ASTM D2369 | 52.6 |
| 2. Wt. per Gallon | ASTM D1475 | 10.4 |
| 3. Viscosity Cps (Brookfield) | ASTM D2196 | 6500 (5,20) |
| 4. % Water | ASTM D1364 | 41.50% |
| 5. Stability 77°F | ASTM D1849 | 6500 (5,20) |
| 6. Stability 120°F | ASTM D1849 | * 7000 (5,20) |
| 7. Freeze - Thaw Res. (All H ₂ O Based Products) | ASTM D2243 | * 5800 (5,20) |
| 8. Dry Time | ASTM D1640 | STT: 30 min. |
| 9. Hardness | ASTM D3363 | DH: 65 min. |
| 10. Humidity Res. | ASTM D2247 | HB |
| 11. Adhesion | ASTM D3359 | 99% blisters on |
| 12. En. Holdout (self sealing) | --- | field, no rust |
| 13. H ₂ O Cleanup (All H ₂ O Based Products) | --- | 2 |
| 14. Flexibility | ASTM D1737 | 0.98 |
| 15. Impact Res. (80 in lb) | ASTM D2794 | Satisfactory |
| 16. Appearance | --- | Passed 1/8" mandrel |
| 17. Application Properties | --- | Passed |
| 18. Sag Res. | ASTM D2801 | Smooth |
| 19. Levelling | ASTM D2801 | Sprayable at |
| 20. Salt Spray Res. | ASTM B117 | 67% reduction |
| 21. VOC | | 12 |
| 22. Pot Life | | 0 |
| 23. Intercoat Adhesion | | Poor-see attached |
| | | 1. 73.57 2. 151.56 |
| | | N/A |
| | | A. 4 B. 5 |

*Smooth paste, no skin

Note: Items 13, 16, 17 are qualitative tests. Item 12 run as described.

- Enamel Holdout: ratio of 60° gloss of TT489 enamel over paint vs sealed Morest chart.
- Application properties: includes brush, roller, spray (airless, conventional) as applicable.
- Intercoat Adhesion: A. TTP19 B. TTE489

20. Salt Spray Resistance

| | Size | Frequency | Pattern | Extent of Corrosion |
|---------------|------|------------|---|-----------------------|
| 1. Blistering | 6 | Med. dense | Uniform at both scribes | -- |
| | 8 | Med. | Random over field | -- |
| 2. Corrosion | -- | -- | Uniform at both scribes, some random isolated field corrosion | 1/8" from each scribe |

LABORATORY REPORT FORM

Contract # A4 166 48

Sample No. RDA -II-17-3
Contract No. A5 097 48
Date received: 4/16/86
Log No.: 416 2A-2C
Lab code: 050-3C
Quantity: 1 Pt./2 Qts.
Test initiated: 4/21/86
Test completed: 12/86

Chemist: A. Khan
R. Haffner

Product Category: 3. Industrial Maintenance Primers

| Tests | Procedure | Results |
|---|------------|-------------------------------------|
| 1. Total NV % Wt. | ASTM D2369 | 47.2 |
| 2. Wt. per Gallon | ASTM D1475 | 10.1 |
| 3. Viscosity Cps (Brookfield) | ASTM D2196 | 3300 (5,20) |
| 4. % Water | ASTM D1364 | 48.40 |
| 5. Stability 77°F | ASTM D1849 | 3550 (5,20) |
| 6. Stability 120°F | ASTM D1849 | * see note |
| 7. Freeze - Thaw Res. (All H ₂ O Based Products) | ASTM D2243 | ** 3400 (5,20) |
| 8. Dry Time | ASTM D1640 | STT: 24 min. DH: 38 min. |
| 9. Hardness | ASTM D3363 | HB |
| 10. Humidity Res. | ASTM D2247 | No blisters or rust |
| 11. Adhesion | ASTM D3359 | 4 |
| 12. En. Holdout (self sealing) | --- | 1.06 |
| 13. H ₂ O Cleanup (All H ₂ O Based Products) | --- | Fair |
| 14. Flexibility | ASTM D1737 | Passes 1/8" mandrel |
| 15. Impact Res. (80 in lb) | ASTM D2794 | Passed |
| 16. Appearance | --- | Smooth; slight grit |
| 17. Application Properties | --- | Sprayable 30% H ₂ O red. |
| 18. Sag Res. | ASTM D2801 | 12 |
| 19. Levelling | ASTM D2801 | 0 |
| 20. Salt Spray Res. | ASTM B117 | Poor -see attached |
| 21. VOC | | 1. 53.29 2. 128.59 |
| 22. Pot Life | | N/A |
| 23. Intercoat Adhesion | | A. 5 B. 5 |

*Jelled, formed very thick paste, settled

**No skin, smooth

Note: Items 13, 16, 17 are qualitative tests. Item 12 run as described.

- Enamel Holdout: ratio of 60° gloss of TT489 enamel over paint vs sealed Morest chart.
- Application properties: includes brush, roller, spray (airless, conventional) as applicable.
- Intercoat Adhesion: A. TTP19 B. TTE489

| | Size | Frequency | Pattern | Extent of Corrosion |
|---------------|------|---------------|---|-----------------------|
| 1. Blistering | 6 | Med. | Unifom at both scribe | -- |
| | 8 | Med. dense | Isolated on field near vertical scribe | |
| 2. Corrosion | -- | -- | Uniform at both scribes, some random isolated field corrosion | 1/8" from each scribe |

LABORATORY REPORT FORM

Contract # A4 166 48

Sample No. JFN #1
Contract No. A5 097 48
Date received: 7/11/86
Log No.: 711 1A-1B
Lab code: IMP3
Quantity: 2 qts.
Test initiated: 7/11/86
Test completed: 12/86

Chemist: R. Haffner

Product Category: 3. Industrial Maintenance Primers

| Tests | Procedure | Results |
|---|------------|----------------------------|
| 1. Total NV % Wt. | ASTM D2369 | 80.46 |
| 2. Wt. per Gallon | ASTM D1475 | 11.28 |
| 3. Viscosity Cps (Brookfield) | ASTM D2196 | 1780 (4,50) |
| 4. % Water | ASTM D1364 | 0.61 |
| 5. Stability 77°F | ASTM D1849 | 1800 (4,50) no skins, sed. |
| 6. Stability 120°F | ASTM D1849 | 1530 (4,50) settles |
| 7. Freeze - Thaw Res. (All H ₂ O Based Products) | ASTM D2243 | N/A |
| 8. Dry Time | ASTM D1640 | STT: 5 hrs. DH: 12 hrs. |
| 9. Hardness (Q panel) | ASTM D3363 | HB |
| 10. Humidity Res. (Q panel) | ASTM D2247 | see attached |
| 11. Adhesion (Q panel) | ASTM D3359 | 2 |
| 12. En. Holdout (self sealing) | --- | 0.95 |
| 13. H ₂ O Cleanup (All H ₂ O Based Products) | --- | N/A solvent base |
| 14. Flexibility (Q panel) | ASTM D1737 | 1/8" mandrel |
| 15. Impact Res. (Q panel) | ASTM D2794 | 80.5 in. lbs |
| 16. Appearance (semi glossy, smooth) | --- | Good |
| 17. Application Properties | --- | * See below |
| 18. Sag Res. | ASTM D2801 | 12 |
| 19. Levelling | ASTM D2801 | 1 |
| 20. Salt Spray Res. | ASTM B117 | Exc.-see attached |
| 21. VOC | | 256.02 |
| 22. Pot Life | | 8 hrs. 30 min. |
| 23. Intercoat Adhesion | | A. 3 B. 5 |

* Conventional spraying-must be reduced with 1,1,1 Trichloroethane. 10% by vol., brushability-good

Note: Items 13, 16, 17 are qualitative tests. Item 12 run as described.

- Enamel Holdout: ratio of 60° gloss of TT489 enamel over paint vs sealed Morest chart.
- Application properties: includes brush, roller, spray (airless, conventional) as applicable.
- Intercoat Adhesion: A. TTP19 B. TTE489

10. Humidity Resistance

| | Size | Freq. | Pattern | Extent of Corrosion |
|---------------|------|-------|---------|---------------------|
| 1. Blistering | None | -- | -- | -- |
| 2. Corrosion | None | -- | -- | -- |

20. Salt Spray Resistance

| | Size | Freq. | Pattern | Extend of Corrosion |
|---------------|------|-------|----------------------------|-----------------------|
| 1. Blistering | 8 | med. | Uniform along both scribes | -- |
| 2. Corrosion | -- | -- | Uniform at both scribes | 3/8" from each scribe |

LABORATORY REPORT FORM

Contract # A4 166 48

Sample No. RDA -II-19-1
 Contract No. A5 097 48
 Date received: 3/18/86
 Log No.: 318-3A-3C
 Lab code: 018-4A-00
 Quantity: 1 Pt./2 Qts.
 Test initiated: 3/21/86
 Test completed: 12/86

Chemist: A. Khan
R. Haffner

Product Category: 4. Industrial Maintenance Topcoats

| <u>Tests</u> | <u>Procedure</u> | <u>Results</u> |
|---------------------------------------|--------------------|---------------------|
| 1. Total NV % Wt. | ASTM D2369 | 51.49 |
| 2. Wt. per Gallon | ASTM D1475 | 10.49 |
| 3. Viscosity Cps (Brookfield) | ASTM D2196 | 2925 (3,20) |
| 4. % Water | ASTM D1364 | 41.4 |
| 5. Stability 77°F | ASTM D1849 | 2938 (3,20) |
| 6. Stability 120°F (=cps) | ASTM D1849 | * 4675 (3,20) |
| 7. Freeze - Thaw Res. (=cps) | ASTM D2243 | ** 3100 (3,20) |
| (All H ₂ O Based Products) | | STT: 20 min. |
| 8. Dry Time | ASTM D1640 | DH: 30 min. |
| 9. Hardness | ASTM D3363 | HB |
| 10. 60° Gloss | ASTM D523 | 22 |
| 11. Yellowness Index | STD 141B 6131 | N/A (green) |
| 12. Humidity Res. | ASTM D2247 | No blisters or rust |
| 13. Adhesion | ASTM D3359 | 3 |
| 14. H ₂ O Cleanup | --- | Good |
| (All H ₂ O Based Products) | | |
| 15. Abrasion Res. | ASTM D4060 | 0.063 gms |
| 16. Flexibility | ASTM D1737 | Passed 1/8" mandrel |
| 17. Impact Res. | ASTM D2794 | Passed 80 in. lbs. |
| 18. Appearance | --- | Smooth finish |
| 19. Application Properties | --- *** | See below |
| 20. Sag Res. | ASTM D2801 | 11 |
| 21. Levelling | ASTM D2801 | 2.5 |
| 22. Contrast Ratio | ASTM D2805 | 1.0 |
| 23. Acc. Weathering | ASTM G23, D822**** | 14 See below |
| 24. Salt Spray Res. | ASTM B117 | Poor- see attached |
| 25. VOC | | 1. 89.43 2. 185.34 |
| 26. Pot Life | | N/A |

Note: Items 14, 18, 19 are qualitative tests.

Application properties: includes brush, roller, spray
 (airless, conventional) as applicable.

*Thickened slightly, but pasty

**Smooth paste

***Water reduced, sprayable at 25% reduction

****Some uniform edge corrosion, some isolated. #6 blisters
 on edges

24. Salt Spray Resistance

| | Size | Frequency | Pattern | Extent of Corrosion |
|---------------|------|-----------|---|---------------------|
| 1. Blistering | 6 | Dense | Uniform at both scribes and over field | -- |
| 2. Corrosion | -- | -- | Uniform at both scribes, uniform over field, some isolated edge corrosion | 1" from each scribe |

LABORATORY REPORT FORM

Contract # A4 166 48

Sample No. RDA -II-19-2
 Contract No. A5 097 48
 Date received: 3/18/86
 Log No.: 318-4A-4C
 Lab code: 019-4A-00
 Quantity: 1 Pt/2 Qts.
 Test initiated: 3/21/86
 Test completed: 12/86

Chemist: A. Khan
 R. Haffner

Product Category: 4. Industrial Maintenance Topcoats

| Tests | Procedure | Results |
|---|----------------|---------------------------------|
| 1. Total NV % Wt. | ASTM D2369 | 51.11 |
| 2. Wt. per Gallon | ASTM D1475 | 10.24 |
| 3. Viscosity Cps (Brookfield) | ASTM D2196 | 2375 (3,20) |
| 4. % Water | ASTM D1364 | 43.0 |
| 5. Stability 77°F | ASTM D1849 | 2375 (3,20) |
| 6. Stability 120°F | ASTM D1849 | 9700 cps (3,10) |
| 7. Freeze - Thaw Res. (All H ₂ O Based Products) | ASTM D2243 | 2400 cps (3,20) STT: 21 min. |
| 8. Dry Time | ASTM D1640 | DH: 31 min. |
| 9. Hardness | ASTM D3363 | HB |
| 10. 60° Gloss | ASTM D523 | 14 |
| 11. Yellowness Index | STD 141B 6131 | N/A (green) |
| 12. Humidity Res. | ASTM D2247 | * see note below |
| 13. Adhesion | ASTM D3359 | 3 |
| 14. H ₂ O Cleanup (All H ₂ O Based Products) | --- | Washable when wet |
| 15. Abrasion Res. | ASTM D4060 | 0.076 gms |
| 16. Flexibility | ASTM D1737 | Passed 1/8" mandrel |
| 17. Impact Res. | ASTM D2794 | Passed 80 in. lbs. |
| 18. Appearance | --- | Slightly gritty |
| 19. Application Properties | --- | Sprayable at 25% Reduction |
| 20. Sag Res. | ASTM D2801 | 10 |
| 21. Levelling | ASTM D2801 | 2-3 |
| 22. Contrast Ratio | ASTM D2805 | 1.0 |
| 23. Acc. Weathering | ASTM G23, D822 | ** 9 see below |
| 24. Salt Spray Res. | ASTM B117 | Poor- see attached |
| 25. VOC | | 1. 72.31 2. 152.10 |
| 26. Pot Life | | N/A |

*Small blisters and pinhole corrosion

**Uniform #8 blisters over field

Note: Items 14, 18, 19 are qualitative tests.

Application properties: includes brush, roller, spray
 (airless, conventional) as applicable.

24. Salt Spray Resistance

| | Size | Frequency | Pattern | Extent of Corrosion |
|---------------|------|-----------|--|---------------------|
| 1. Blistering | 8 | Dense | Uniform at both scribes and over entire field | -- |
| 2. Corrosion | -- | -- | Uniform at both scribes, and over entire field | 1" from each scribe |

LABORATORY REPORT FORM

Contract # A4 166 48

Sample No. RDA -II-19-3
 Contract No. A5 097 48
 Date received: 4/11/86
 Log No.: 411 2A
 Lab code: 048-4A
 Quantity: 3/4 Qt.
 Test initiated: 4/14/86
 Test completed: 12/86

Chemist: A. Khan
R. Haffner

Product Category: 4. Industrial Maintenance Topcoats

| <u>Tests</u> | <u>Procedure</u> | <u>Results</u> |
|---|------------------|----------------------------|
| 1. Total NV % Wt. | ASTM D2369 | <u>49.8</u> |
| 2. Wt. per Gallon | ASTM D1475 | <u>10.06</u> |
| 3. Viscosity Cps (Brookfield) | ASTM D2196 | <u>4400 (3,5)</u> |
| 4. % Water | ASTM D1364 | <u>45.82</u> |
| 5. Stability 77°F | ASTM D1849 | <u>4450 (3,5)</u> |
| 6. Stability 120°F | ASTM D1849 | <u>4400 (3,5)</u> |
| 7. Freeze - Thaw Res. (All H ₂ O Based Products) | ASTM D2243 | <u>4400 cps (3,5)</u> |
| 8. Dry Time | ASTM D1640 | <u>STT: 18 min.</u> |
| 9. Hardness | ASTM D3363 | <u>DH: 28 min.</u> |
| 10. 60° Gloss | ASTM D523 | <u>HB</u> |
| 11. Yellowness Index | STD 141B 6131 | <u>19</u> |
| 12. Humidity Res. (48 hrs) | ASTM D2247 | <u>N/A (orange)</u> |
| 13. Adhesion | ASTM D3359 | <u>No blisters or rust</u> |
| 14. H ₂ O Cleanup (All H ₂ O Based Products) | --- | <u>5</u> |
| 15. Abrasion Res. | ASTM D4060 | <u>Satisfactory</u> |
| 16. Flexibility | ASTM D1737 | <u>0.077 gms</u> |
| 17. Impact Res. | ASTM D2794 | <u>Passes 1/8" mandrel</u> |
| 18. Appearance | --- | <u>Passed 80 in. lbs.</u> |
| 19. Application Properties | --- | <u>Smooth</u> |
| 20. Sag Res. | ASTM D2801 | <u>Sprayable upon</u> |
| 21. Levelling | ASTM D2801 | <u>15% reduction</u> |
| 22. Contrast Ratio | ASTM D2805 | <u>12</u> |
| 23. Acc. Weathering | ASTM G23, D822 | <u>0</u> |
| 24. Salt Spray Res. | ASTM B117 | <u>0.99</u> |
| 25. VOC | | <u>15 see below</u> |
| 26. Pot Life | | <u>Poor-see attached</u> |
| | | <u>1. 52.83 2. 117.34</u> |
| | | <u>N/A</u> |

*Some uniform edge corrosion

Note: Items 14, 18, 19 are qualitative tests.

Application properties: includes brush, roller, spray
 (airless, conventional) as applicable.

24. Salt Spray Resistance

| | Size | Frequency | Pattern | Extent of Corrosion |
|---------------|------|-----------|---|------------------------|
| 1. Blistering | 4 | Dense | Uniform at both scribes and on field surrounding crosshatch | -- |
| | 8 | Med. | Random over field | -- |
| 2. Corrosion | -- | -- | Uniform at both scribes | 1/16" from each scribe |

LABORATORY REPORT FORM

Contract # A4 166 48

Sample No. RDA -II-19-4
 Contract No. A5 097 48
 Date received: 4/17/86
 Log No.: 416 3A-3C
 Lab code: 051-4A
 Quantity: 1 Pt./2 Qts.
 Test initiated: 4/21/86
 Test completed: 12/86

Chemist: A. Khan
R. Haffner

Product Category: 4. Industrial Maintenance Topcoats

| <u>Tests</u> | <u>Procedure</u> | <u>Results</u> |
|---|------------------|----------------------------|
| 1. Total NV % Wt. | ASTM D2369 | <u>51.5</u> |
| 2. Wt. per Gallon | ASTM D1475 | <u>9.9</u> |
| 3. Viscosity Cps (Brookfield) | ASTM D2196 | <u>2960 (5,50)</u> |
| 4. % Water | ASTM D1364 | <u>46.97</u> |
| 5. Stability 77°F | ASTM D1849 | <u>2640 (5,50)</u> |
| 6. Stability 120°F | ASTM D1849 | <u>2240 cps (5,50)</u> |
| 7. Freeze - Thaw Res. (All H ₂ O Based Products) | ASTM D2243 | <u>2560 cps (5,50)</u> |
| 8. Dry Time | ASTM D1640 | <u>STT: 20 min.</u> |
| 9. Hardness | ASTM D3363 | <u>DH: 35 min.</u> |
| 10. 60° Gloss | ASTM D523 | <u>HB</u> |
| 11. Yellowness Index | STD 141B 6131 | <u>41</u> |
| 12. Humidity Res. | ASTM D2247 | <u>N/A (grey)</u> |
| 13. Adhesion | ASTM D3359 | <u>35% blisters;</u> |
| 14. H ₂ O Cleanup (All H ₂ O Based Products) | --- | <u>slight rust</u> |
| 15. Abrasion Res. | ASTM D4060 | <u>Between primer=4;</u> |
| 16. Flexibility | ASTM D1737 | <u>substrate =2</u> |
| 17. Impact Res. | ASTM D2794 | <u>Satisfactory</u> |
| 18. Appearance | --- | <u>0.094 gms</u> |
| 19. Application Properties | --- | <u>Passed 1/8" mandrel</u> |
| 20. Sag Res. | ASTM D2801 | <u>Passed 80 in. lbs.</u> |
| 21. Levelling | ASTM D2801 | <u>Smooth; slight grit</u> |
| 22. Contrast Ratio | ASTM D2805 | <u>*see below</u> |
| 23. Acc. Weathering | ASTM G23, D822 | <u>12</u> |
| 24. Salt Spray Res. | ASTM B117 | <u>0</u> |
| 25. VOC | | <u>0.994</u> |
| 26. Pot Life | | <u>** 30 -see below</u> |
| | | <u>Fair-see attached</u> |
| | | <u>1. 18.16 2. 40.73</u> |
| | | <u>N/A</u> |

*Sprayable upon 20% reduction H₂O

**Some isolated edge corrosion uniform #8 blisters over field

Note: Items 14, 18, 19 are qualitative tests.

Application properties: includes brush, roller, spray
 (airless, conventional) as applicable.

24. Salt Spray Resistance

| | Size | Frequency | Pattern | Extent of Corrosion |
|---------------|------|-----------|-----------------------------------|------------------------------|
| 1. Blistering | 6 | Med. | Uniform at both scribes, | -- |
| | 8 | Few | Random isolated field blisters | -- |
| 2. Corrosion | -- | -- | Uniform at both scribes | 1/16" from each scribe |

LABORATORY REPORT FORM

Contract # A4 166 48

Sample No. RDA -II-19-5
 Contract No. A5 097 48
 Date received: 4/16/86
 Log No.: 416-4A-4C
 Lab code: 052-4A
 Quantity: 1 Pt./2 Qts.
 Test initiated: 4/21/86
 Test completed: 12/86

Chemist: A. Khan
R. Haffner

Product Category: 4. Industrial Maintenance Topcoats

| <u>Tests</u> | <u>Procedure</u> | <u>Results</u> |
|---|------------------|---|
| 1. Total NV % Wt. | ASTM D2369 | <u>46.8</u> |
| 2. Wt. per Gallon | ASTM D1475 | <u>10.12</u> |
| 3. Viscosity Cps (Brookfield) | ASTM D2196 | <u>3480 (5,50)</u> |
| 4. % Water | ASTM D1364 | <u>47.66</u> |
| 5. Stability 77°F | ASTM D1849 | <u>3400 (5,50)</u> |
| 6. Stability 120°F | ASTM D1849 | <u>2720 cps (5,50)</u> |
| 7. Freeze - Thaw Res. (All H ₂ O Based Products) | ASTM D2243 | <u>3040 cps (5,50)</u> |
| 8. Dry Time | ASTM D1640 | STT: 20 min. DH: 30 min. |
| 9. Hardness | ASTM D3363 | <u>HB</u> |
| 10. 60° Gloss | ASTM D523 | <u>63.5</u> |
| 11. Yellowness Index | STD 141B 6131 | <u>n= .0018</u> |
| 12. Humidity Res. | ASTM D2247 | <u>99% field blisters; no rust</u> |
| 13. Adhesion | ASTM D3359 | <u>4</u> |
| 14. H ₂ O Cleanup (All H ₂ O Based Products) | --- | <u>Satisfactory</u> |
| 15. Abrasion Res. | ASTM D4060 | <u>0.071 gms</u> |
| 16. Flexibility | ASTM D1737 | <u>Passed 1/8" mandrel</u> |
| 17. Impact Res. (80 in lb) | ASTM D2794 | <u>Passed 80 in. lbs.</u> |
| 18. Appearance | --- | <u>Smooth</u> |
| 19. Application Properties | --- | <u>Sprayable upon 50% reduction</u> |
| 20. Sag Res. | ASTM D2801 | <u>12</u> |
| 21. Levelling | ASTM D2801 | <u>0</u> |
| 22. Contrast Ratio | ASTM D2805 | <u>0.968</u> |
| 23. Acc. Weathering | ASTM G23, D822 | * <u>41- see below</u> |
| 24. Salt Spray Res. | ASTM B117 | <u>Fair- see attached</u> |
| 25. VOC | | <u>1. 72.23 2. 170.59</u> |
| 26. Pot Life | | <u>N/A</u> |

*Uniform edge corrosion, uniform #8 blisters on edges

Note: Items 14, 18, 19 are qualitative tests.

Application properties: includes brush, roller, spray
 (airless, conventional) as applicable.

24. Salt Spray Resistance

| | Size | Frequency | Pattern | Extent of Corrosion |
|---------------|------|-----------|---|-----------------------|
| 1. Blistering | 4 | Med. | Uniform at both scribes | -- |
| 2. Corrosion | -- | -- | Uniform at both scribes, some isolated random field | 1/8" from each scribe |

LABORATORY REPORT FORM

Contract # A4 166 48

Sample No. RDA -II-19-6
 Contract No. A5 097 48
 Date received: 4/23/86
 Log No.: 423 1A-1C
 Lab code: 054-4A
 Quantity: 1 Pt./2 Qts.
 Test initiated: 4/25/86
 Test completed: 12/86

Chemist: A. Khan
R. Haffner

Product Category: 4. Industrial Maintenance Topcoats

| <u>Tests</u> | <u>Procedure</u> | <u>Results</u> |
|---|------------------|----------------------------|
| 1. Total NV % Wt. | ASTM D2369 | <u>52.2</u> |
| 2. Wt. per Gallon | ASTM D1475 | <u>10.84</u> |
| 3. Viscosity Cps (Brookfield) | ASTM D2196 | <u>3200 cps (4,20)</u> |
| 4. % Water | ASTM D1364 | <u>43.59%</u> |
| 5. Stability 77°F | ASTM D1849 | <u>3240 (4,20)</u> |
| 6. Stability 120°F | ASTM D1849 | <u>4100 cps (4,20)</u> |
| 7. Freeze - Thaw Res. (All H ₂ O Based Products) | ASTM D2243 | <u>3100 cps (4,20)</u> |
| 8. Dry Time | ASTM D1640 | <u>STT: 24 min.</u> |
| 9. Hardness | ASTM D3363 | <u>DH: 39 min.</u> |
| 10. 60° Gloss | ASTM D523 | <u>HB</u> |
| 11. Yellowness Index | STD 141B 6131 | <u>6.0 flat</u> |
| 12. Humidity Res. | ASTM D2247 | <u>N/A (green)</u> |
| 13. Adhesion | ASTM D3359 | <u>No blisters or rust</u> |
| 14. H ₂ O Cleanup (All H ₂ O Based Products) | --- | <u>5</u> |
| 15. Abrasion Res. | ASTM D4060 | <u>Washable when wet</u> |
| 16. Flexibility | ASTM D1737 | <u>(satisfactory)</u> |
| 17. Impact Res. | ASTM D2794 | <u>0.097 gms</u> |
| 18. Appearance | --- | <u>Passed 1/8" mandrel</u> |
| 19. Application Properties | --- | <u>Passed 80 in lbs.</u> |
| 20. Sag Res. | ASTM D2801 | <u>Smooth</u> |
| 21. Levelling | ASTM D2801 | <u>Sprayable upon</u> |
| 22. Contrast Ratio | ASTM D2805 | <u>63% reduction</u> |
| 23. Acc. Weathering | ASTM G23, D822 * | <u>12</u> |
| 24. Salt Spray Res. | ASTM B117 | <u>0</u> |
| 25. VOC | | <u>1.0</u> |
| 26. Pot Life | | <u>4- see below</u> |
| | | <u>Fair-see attached</u> |
| | | <u>1. 54.72 2. 125.01</u> |
| | | <u>N/A</u> |

*Slight uniform edge corrosion; random #8 blisters on edges

Note: Items 14, 18, 19 are qualitative tests.

Application properties: includes brush, roller, spray
 (airless, conventional) as applicable.

24. Salt Spray Resistance

| | Size | Frequency | Pattern | Extent of Corrosion |
|---------------|------|-----------|----------------------------|--------------------------|
| 1. Blistering | 8 | Med. | Uniform at both scribes | |
| 2. Corrosion | -- | -- | Uniform at both scribes | 1/8" from each scribe |

LABORATORY REPORT FORM

Contract # A4 166 48

Sample No. RDA -II-20-1
 Contract No. A5 097 48
 Date received: 3/18/86
 Log No.: 318-6A-6C
 Lab code: 020-4B-00
 Quantity: 1 Pt./2 Qts.
 Test initiated: 3/21/86
 Test completed: 12/86

Chemist: A. Khan
R. Haffner

Product Category: 4. Industrial Maintenance Topcoats

| <u>Tests</u> | <u>Procedure</u> | <u>Results</u> |
|---|------------------|---|
| 1. Total NV % Wt. | ASTM D2369 | <u>30.23</u> |
| 2. Wt. per Gallon | ASTM D1475 | <u>8.99</u> |
| 3. Viscosity Cps (Brookfield) | ASTM D2196 | <u>4200 (3,20)</u> |
| 4. % Water | ASTM D1364 | <u>60.10</u> |
| 5. Stability 77°F | ASTM D1849 | <u>4060 (3,20) exploded</u> |
| 6. Stability 120°F | ASTM D1849 | <u>1200 cps (5,20) slight ga</u> |
| 7. Freeze - Thaw Res. (All H ₂ O Based Products) | ASTM D2243 | <u>8500 cps (3,10) slight ga</u> <u>STT: 37 min.</u> |
| 8. Dry Time | ASTM D1640 | <u>DH: 73 min.</u> |
| 9. Hardness | ASTM D3363 | <u>HB</u> |
| 10. 60° Gloss | ASTM D523 | <u>20</u> |
| 11. Yellowness Index | STD 141B 6131 | <u>N/A (silver)</u> |
| 12. Humidity Res. | ASTM D2247 | <u>* see note.</u> |
| 13. Adhesion | ASTM D3359 | <u>5</u> |
| 14. H ₂ O Cleanup (All H ₂ O Based Products) | --- | <u>Washable when wet</u> |
| 15. Abrasion Res. | ASTM D4060 | <u>0.107 gms</u> |
| 16. Flexibility | ASTM D1737 | <u>Passed 1/8" mandrel</u> |
| 17. Impact Res. | ASTM D2794 | <u>Passed 80 in. lbs.</u> |
| 18. Appearance | --- | <u>Slight grit</u> |
| 19. Application Properties | --- | <u>** Brushable</u> |
| 20. Sag Res. | ASTM D2801 | <u>12</u> |
| 21. Levelling | ASTM D2801 | <u>0</u> |
| 22. Contrast Ratio | ASTM D2805 | <u>0.98</u> |
| 23. Acc. Weathering | ASTM G23, D822 | <u>*** 18- see below</u> |
| 24. Salt Spray Res. | ASTM B117 | <u>Very Poor-see attached</u> |
| 25. VOC | | <u>1. 105.31 2. 294.98</u> |
| 26. Pot Life | | <u>N/A</u> |

*No blisters, very slight pinhole rust

**Sprayable at 30% Reduction

*** (slight) random edge corrosion uniform #8 blisters over field

Note: Items 14, 18, 19 are qualitative tests.

Application properties: includes brush, roller, spray
 (airless, conventional) as applicable.

24. Salt Spray Resistance

| | Size | Frequency | Pattern | Extent of Corrosion |
|---------------|------|-----------|--|--------------------------------------|
| 1. Blistering | 4 | Dense | Uniform at both scribes, uniform over field | -- |
| 2. Corrosion | -- | -- | Uniform at both scribes, and over entire field | Excessive 1 1/2" from each scribe |

LABORATORY REPORT FORM

Contract # A4 166 48

Sample No. JFN #2
 Contract No. A5 097 48
 Date received: 7/11/86
 Log No.: 711 2A-2B
 Lab code: IMT4
 Quantity: 2 qts.
 Test initiated: 7/11/86
 Test completed: 12/86

Chemist: R. Haffner

Product Category: 4. Industrial Maintenance Topcoats

| <u>Tests</u> | <u>Procedure</u> | <u>Results</u> |
|---|------------------|----------------------------|
| 1. Total NV % Wt. | ASTM D2369 | 90.98 |
| 2. Wt. per Gallon | ASTM D1475 | 14.96 lbs.gal |
| 3. Viscosity Cps (Brookfield) | ASTM D2196 | 5850 (4,20) |
| 4. % Water | ASTM D1364 | 0.16 |
| 5. Stability 77°F (no skins, sed) | ASTM D1849 | 4500 (4,20) 3 months |
| 6. Stability 120°F | ASTM D1849 | 2650 (4,20) |
| 7. Freeze - Thaw Res. (All H ₂ O Based Products) | ASTM D2243 | N/A |
| 8. Dry Time | ASTM D1640 | STT: 3 hrs. DH: 26 hrs. |
| 9. Hardness Q panel | ASTM D3363 | HB |
| 10. 60° Gloss Q panel | ASTM D523 | 96 |
| 11. Yellowness Index 96 hrs | STD 141B 6131 | n = .0018 |
| 12. Humidity Res. Q panel 48 hrs | ASTM D2247 | see attached |
| 13. Adhesion Q panel | ASTM D3359 | 3 |
| 14. H ₂ O Cleanup (All H ₂ O Based Products) | --- | N/A Solvent base |
| 15. Abrasion Res. | ASTM D4060 | 0.059 gms |
| 16. Flexibility Q panel | ASTM D1737 | 1/8" mandrel |
| 17. Impact Res. Q panel | ASTM D2794 | 80.5 in. lb. |
| 18. Appearance | --- | Exc.; high gloss |
| 19. Application Properties | --- | * See below |
| 20. Sag Res. | ASTM D2801 | 11 |
| 21. Levelling | ASTM D2801 | 4 |
| 22. Contrast Ratio | ASTM D2805 | 0.99 |
| 23. Acc. Weathering 300 hrs | ASTM G23, D822 | ** 51 see below |
| 24. Salt Spray Res. | ASTM B117 | Excellent-see attached |
| 25. VOC | | 158.98 |

*Conventional spraying-must be reduced with 1,1,1 Trichloroethane, 10% by vol. Brushability-good

**Some wrinkling of coating; slight edge corrosion (random)
 mil thickness: 2.2

Note: Items 14, 18, 19 are qualitative tests.

Application properties: includes brush, roller, spray
 (airless, conventional) as applicable.

Paint cures very slowly at ambient temperature

12. Humidity Resistance

| | Size | Freq. | Pattern | Extent of Corrosion |
|---------------|------|-------|---------|---------------------|
| 1. Blistering | None | -- | -- | -- |
| 2. Corrosion | None | -- | -- | -- |

24. Salt Spray Resistance

| | Size | Freq. | Pattern | Extent of Corrosion |
|---------------|------|--------|--|---------------------|
| 1. Blistering | 8 | V. Few | Random over field | -- |
| 2. Corrosion | -- | -- | Random at both scribes, no field corrosion | 1/8" from scribes |

LABORATORY REPORT FORM

Contract # A4 166 48

Sample No. JFN #7
 Contract No. A5 097 48
 Date received: 7/11/86
 Log No.: 711 7A-7B
 Lab code: 4IMT
 Quantity: 2 qts.
 Test initiated: 7/11/86
 Test completed: 12/86

Chemist: R. Haffner

Product Category: 4. Industrial Maintenance Topcoats

| Tests | Procedure | Results |
|---|----------------|----------------------------------|
| 1. Total NV % Wt. | ASTM D2369 | 68.14 |
| 2. Wt. per Gallon | ASTM D1475 | 12.58 lbs/gal |
| 3. Viscosity Cps (Brookfield) | ASTM D2196 | 5750 (4,20) |
| 4. % Water | ASTM D1364 | 17.35 |
| 5. Stability 77°F | ASTM D1849 | Gelled |
| 6. Stability 120°F | ASTM D1849 | 27,600 (4,20) |
| 7. Freeze - Thaw Res. (All H ₂ O Based Products) | ASTM D2243 | 5700 passed (4,20) |
| 8. Dry Time | ASTM D1640 | STT: 35 min. DH: 3hrs. 30 min |
| 9. Hardness Q panel | ASTM D3363 | HB |
| 10. 60° Gloss Q panel | ASTM D523 | 4 |
| 11. Yellowness Index | STD 141B 6131 | N/A (blue) |
| 12. Humidity Res. Q panel | ASTM D2247 | see attached |
| 13. Adhesion Q panel | ASTM D3359 | 5 |
| 14. H ₂ O Cleanup (All H ₂ O Based Products) | --- | Good |
| 15. Abrasion Res. | ASTM D4060 | 0.232 gms |
| 16. Flexibility Q panel | ASTM D1737 | 1/8" mandrel |
| 17. Impact Res. Q panel | ASTM D2794 | 80.5 in. lbs. |
| 18. Appearance Flat, Q panel | --- | Good |
| 19. Application Properties | --- | * See below |
| 20. Sag Res. | ASTM D2801 | 12 |
| 21. Levelling | ASTM D2801 | 1 |
| 22. Contrast Ratio | ASTM D2805 | 0.97 |
| 23. Acc. Weathering 300 hrs | ASTM G23, D822 | ** 3 see below |
| 24. Salt Spray Res. | ASTM B117 | Poor-see attached |
| 25. VOC | | 1. 218.85 2. 295.82 |
| 26. Pot Life | | N/A (1 component) |

* Brushability-good

**Small pits, uniform field corrosion. D.F.T. 1.7

Conventional spraying-must be reduced with water (5% by vol.)

Note: Items 14, 18, 19 are qualitative tests.

Application properties: includes brush, roller, spray
 (airless, conventional) as applicable.

12. Humidity Resistance

| | Size | Freq. | Pattern | Extent of Corrosion |
|---------------|------|-------|---|---------------------|
| 1. Blistering | 8 | med. | Uniform over field | -- |
| 2. Corrosion | -- | -- | Uniform field corrosion Uniform edge corrosion | Upper 1/2 of panel |

24. Salt Spray Resistance

| | Size | Freq. | Pattern | Extent of Corrosion |
|---------------|------|------------|-------------------------|---------------------|
| 1. Blistering | 6 | med. dense | Uniform at both scribes | -- |
| 2. Corrosion | -- | -- | Uniform at both scribes | 1" from each scribe |

LABORATORY REPORT FORM

Contract # A4 166 48

Sample No. RDA -II-21-1
 Contract No. A5 097 48
 Date received: 3/19/86
 Log No.: 319 4A-4C
 Lab code: L5
 Quantity: 1 Pt./2 Qts.
 Test initiated: 3/20/86
 Test completed: 12/86

Chemist: B. Haffner

Product Category: 5. Lacquers

| <u>Tests</u> | <u>Procedure</u> | <u>Results</u> |
|---|-------------------|----------------------------------|
| 1. Total NV % Wt. | ASTM D2369 | <u>22.21</u> |
| 2. Wt. per Gallon | ASTM D1475 | <u>7.32</u> |
| 3. Viscosity Cps (Brookfield) | ASTM D2196 | <u>150 (2,100)</u> |
| 4. Color | ASTM D1729 | <u>1</u> |
| 5. % Water | ASTM D1364 | <u>0.04</u> |
| 6. Stability 77°F | ASTM D1849 | <u>* 148 (2,100)</u> |
| 7. Stability 120°F (no skins, sed.) | ASTM D1849 | <u>* 132 (2,100)</u> |
| 8. Freeze - Thaw Res. (All H ₂ O Based Products) | ASTM D2243 | <u>N/A</u> |
| 9. Dry Time Q panel | ASTM D1640 | <u>STT: 8 min.</u> |
| 10. Hardness | ASTM D3363 | <u>DH: 25 min.</u> |
| 11. Block Res. | STD 141B FTM 6216 | <u>HB</u> |
| 12. Sanding Prop | STD 141B FTM 6321 | <u>45 min.</u> |
| 13. 60° Gloss (sands to smooth) | ASTM D523 | <u>Good; no gumming</u> |
| 14. Yellowness Index | STD 141B 6131 | <u>100 Q panel</u> |
| 15. Humidity Res. | ASTM D2247 | <u>N/A</u> |
| 16. Adhesion | ASTM D3359 | <u>See attached chart</u> |
| 17. H ₂ O Cleanup (All H ₂ O Based Products) | --- | <u>3 (metal) 4 (wood)</u> |
| 18. Abrasion Res. | ASTM D4060 | <u>Oil based (N/A)</u> |
| 19. Flexibility | ASTM D1737 | <u>0.080 gms</u> |
| 20. Impact Res. | ASTM D2794 | <u>1" mandrel</u> |
| 21. Appearance | --- | <u>8.75 in. lbs.</u> |
| 22. Application Properties (conv spray)--- | --- | <u>good-clear, smooth finish</u> |
| 23. Sag Res. | ASTM D2801 | <u>sprays good, brushes exc</u> |
| 24. Levelling | ASTM D2801 | <u>7</u> |
| 25. Contrast Ratio | ASTM D2805 | <u>5</u> |
| 26. Acc. Weathering (300 hrs) 60° specular gloss | ASTM G23, D822 | <u>N/A Clear</u> |
| 27. Salt Spray Res. (200 hours) | ASTM B117 | <u>96</u> |
| 28. VOC | | <u>See attached</u> |
| 29. Grain Raising | | <u>683.00</u> |
| | | <u>Good; slight on</u> |
| | | <u>ponderosa pine</u> |

* No skins, sediment

Note: Items 17, 21, 22 are qualitative tests.

Application properties: includes brush, roller, spray
 (airless, conventional) as applicable.

15. Humidity Resistance

| | Size | Frequency | Pattern | Extent of Corrosion |
|---------------|------|-----------|---------|-----------------------|
| 1. Blistering | None | -- | -- | -- |
| 2. Corrosion | -- | -- | | Minor field corrosion |

27. Salt Spray Resistance

| | Size | Frequency | Pattern | Extent of Corrosion |
|---------------|------|-----------|-------------------------|--|
| 1. Blistering | 4 | Medium | Uniform at both scribes | |
| 2. Corrosion | -- | -- | Uniform at both scribes | 3/8" inch from both scribes; upper half of panel extensive corrosion |

LABORATORY REPORT FORM

Contract # A4 166 48

Sample No. RDA -II-21-2
 Contract No. A5 097 48
 Date received: 3/20/86
 Log No.: 320 6A-6C
 Lab code: L5
 Quantity: 1 Pt./2 Qts.
 Test initiated: 3/21/86
 Test completed: 12/86

Chemist: R. Haffner

Product Category: 5. Lacquers

| <u>Tests</u> | <u>Procedure</u> | <u>Results</u> |
|---|-------------------|-----------------------|
| 1. Total NV % Wt. | ASTM D2369 | 15.62 |
| 2. Wt. Per Gallon | ASTM D1475 | 7.342 |
| 3. Viscosity Cps (Brookfield) | ASTM D2196 | 144 (2,100) |
| 4. Color | ASTM D1729 | 3 |
| 5. % Water | ASTM D1364 | 0.02 |
| 6. Stability 77°F | ASTM D1849 | * 134 (2,100) |
| 7. Stability 120°F | ASTM D1849 | * 128 (2,100) |
| 8. Freeze - Thaw Res. (All H ₂ O Based Products) | ASTM D2243 | N/A |
| 9. Dry Time Q panel | ASTM D1640 | STT: 6 min. |
| 10. Hardness | ASTM D3363 | DH: 30 min. |
| 11. Block Res. | STD 141B FTM 6216 | HB |
| 12. Sanding Prop | STD 141B FTM 6321 | 35 min. |
| 13. 60° Gloss | ASTM D523 | ** Fair |
| 14. Yellowness Index | STD 141B 6131 | 44 Q-panel |
| 15. Humidity Res. | ASTM D2247 | N/A |
| 16. Adhesion | ASTM D3359 | see attached |
| 17. H ₂ O Cleanup (All H ₂ O Based Products) | --- | ***0 (metal) 5 (wood) |
| 18. Abrasion Res. | ASTM D4060 | Solvent based |
| 19. Flexibility | ASTM D1737 | 0.070 gms |
| 20. Impact Res. | ASTM D2794 | 1" mandrel |
| 21. Appearance | --- | 6.12 in. lbs. |
| 22. Application Properties (conventional spraying) | --- | Good-clear |
| 23. Sag Res. | ASTM D2801 | Spraying fair |
| 24. Levelling | ASTM D2801 | Brushing good |
| 25. Contrast Ratio | ASTM D2805 | 4 |
| 26. Acc. Weathering (300 hrs) | ASTM G23, D822 | 7 |
| 27. Salt Spray Res. (200 hrs) | ASTM B117 | N/A |
| 28. VOC | | 38 |
| 29. Grain Raising (some on Ponderosa Pine) | | see attached |
| | | 742.00 |
| | | Fair-good |

*No skins, sediment

**Sands fairly smooth, slight gumming occurred

***Came off completely

Note: Items 17, 21, 22 are qualitative tests.

Application properties: includes brush, roller, spray
 (airless, conventional) as applicable.

15. Humidity Resistance

| | Size | Freq. | Pattern | Extent of Corrosion |
|---------------|------|-------|---------|-------------------------------|
| 1. Blistering | None | -- | -- | -- |
| 2. Corrosion | -- | -- | Random | Some isolated field corrosion |

27. Salt Spray Resistance

| | Size | Freq. | Pattern | Extent of Corrosion |
|---------------|------|--------|---|------------------------|
| 1. Blistering | 2 | Medium | Uniform at both scribes | -- |
| 2. Corrosion | -- | -- | Uniform at both scribes Some random isolated field corrosion | 3/8" from both scribes |

LABORATORY REPORT FORM

Contract # A4 166 48

Sample No. RDA -II-21-3
 Contract No. A5 097 48
 Date received: 3/24/86
 Log No.: 324 1A-1C
 Lab code: L5
 Quantity: 1 Pt./2 Qts.
 Test initiated: 3/24/86
 Test completed: 12/86

Chemist: B. Haffner

Product Category: 5. Lacquers

| <u>Tests</u> | <u>Procedure</u> | <u>Results</u> |
|---|-------------------|---------------------------------|
| 1. Total NV % Wt. | ASTM D2369 | <u>21.63</u> |
| 2. Wt. per Gallon | ASTM D1475 | <u>.7.319</u> |
| 3. Viscosity Cps (Brookfield) | ASTM D2196 | <u>144 (2,100)</u> |
| 4. Color | ASTM D1729 | <u>N/A (clear)</u> |
| 5. % Water | ASTM D1364 | <u>0.05</u> |
| 6. Stability 77°F | ASTM D1849 | <u>* 146 (2,100)</u> |
| 7. Stability 120°F | ASTM D1849 | <u>** 130 (2,100)</u> |
| 8. Freeze - Thaw Res. (All H ₂ O Based Products) | ASTM D2243 | <u>N/A</u> |
| 9. Dry Time (wood-ponderosa pine) | ASTM D1640 | <u>STT: 9 min.</u> |
| 10. Hardness | ASTM D3363 | <u>DH: 35 min.</u> |
| 11. Block Res. | STD 141B FTM 6216 | <u>HB</u> |
| 12. Sanding Prop | STD 141B FTM 6321 | <u>45 min.</u> |
| 13. 60° Gloss | ASTM D523 | <u>Poor; gums easily</u> |
| 14. Yellowness Index | STD 141B 6131 | <u>73 Q panel</u> |
| 15. Humidity Res. | ASTM D2247 | <u>N/A</u> |
| 16. Adhesion | ASTM D3359 | <u>See attached chart</u> |
| 17. H ₂ O Cleanup (All H ₂ O Based Products) | --- | <u>3 (metal) 5 (wood)</u> |
| 18. Abrasion Res. | ASTM D4060 | <u>Solvent based</u> |
| 19. Flexibility | ASTM D1737 | <u>0.067 gms</u> |
| 20. Impact Res. | ASTM D2794 | <u>1/8" mandrel</u> |
| 21. Appearance | --- | <u>14 in.lbs.</u> |
| 22. Application Properties(conv.) | --- | <u>excellent-clear</u> |
| 23. Sag Res. | ASTM D2801 | <u>smooth finish</u> |
| 24. Levelling | ASTM D2801 | <u>sprays good brushes goo</u> |
| 25. Contrast Ratio | ASTM D2805 | <u>3</u> |
| 26. Acc. Weathering (300 hrs) 60° specular gloss | ASTM G23, D822 | <u>8</u> |
| 27. Salt Spray Res. (200 hours) | ASTM B117 | <u>N/A (clear)</u> |
| 28. VOC | | <u>53</u> |
| 29. Grain Raising | | <u>See attached chart</u> |
| | | <u>687.00</u> |
| | | <u>Poor; left surface rough</u> |
| | | <u>on ponderosa pine</u> |

*No skins, sediment

**Some discoloration. Changed from white to light brown

Note: Items 17, 21, 22 are qualitative tests.

Application properties: includes brush, roller, spray
 (airless, conventional) as applicable.

15. Humidity Resistance

| | Size | Frequency | Pattern | Extent of Corrosion |
|---------------|------|-----------|--------------------------------------|---------------------|
| 1. Blistering | None | -- | -- | -- |
| 2. Corrosion | -- | -- | Some random isolated field corrosion | -- |

27. Salt Spray Resistance

| | Size | Frequency | Pattern | Extent of Corrosion |
|---------------|------|-----------|---|------------------------|
| 1. Blistering | 6 | Few | Uniform at both scribes | |
| 2. Corrosion | -- | -- | Very little random isolated field corrosion uniform at both scribes | 1/8" from both scribes |

LABORATORY REPORT FORM

Contract # A4 166 48

Sample No. RDA -II-21-4
Contract No. A5 097 48
Date received: 4/11/86
Log No.: 411 3A-3C
Lab code: L5
Quantity: 1 Pt./2 Qts.
Test initiated: 4/14/86
Test completed: 12/86

Chemist: R. Haffner

Product Category: 5. Lacquers

| Tests | Procedure | Results |
|---|----------------|-------------------------------|
| 1. Total NV % Wt. | ASTM D2369 | 24.05 |
| 2. Wt. per Gallon | ASTM D1475 | 8.457 |
| 3. Viscosity Cps (Brookfield) | ASTM D2196 | 400 (2,50) |
| 4. Color | ASTM D1729 | 10 |
| 5. % Water | ASTM D1364 | 71.79 |
| 6. Stability 77°F | ASTM D1849 | 492 (2,50) orange sediment |
| 7. Stability 120°F | ASTM D1849 | 1485 (2,50) |
| 8. Freeze - Thaw Res. (2,20) (All H ₂ O Based Products) | ASTM D2243 | 660 (2,20) |
| 9. Dry Time (Q panel) | ASTM D1640 | STT: 15 min. DH: 40 min. |
| 10. Hardness | ASTM D3363 | HB |
| 11. Block Res. STD 141B FTM 6216 | | 50 min. |
| 12. Sanding Prop (120 grit) STD 141B FTM 6321 | | * Fair |
| 13. 60° Gloss | ASTM D523 | 75 |
| 14. Yellowness Index | STD 141B 6131 | N/A |
| 15. Humidity Res. | ASTM D2247 | see attached |
| 16. Adhesion | ASTM D3359 | 3 (metal) 5 (wood) |
| 17. H ₂ O Cleanup (All H ₂ O Based Products) | --- | ** Fair, rapid dry |
| 18. Abrasion Res. | ASTM D4060 | 0.038 gms |
| 19. Flexibility | ASTM D1737 | 1" mandrel |
| 20. Impact Res. | ASTM D2794 | 6.13 in/lbs |
| 21. Appearance | --- | *** Good |
| 22. Application Properties (conv) | --- | Fair brushes- Fair on wood |
| 23. Sag Res. | ASTM D2801 | 2 |
| 24. Levelling | ASTM D2801 | 7 |
| 25. Contrast Ratio | ASTM D2805 | N/A |
| 26. Acc. Weathering (300 hrs) | ASTM G23, D822 | 52 |
| 27. Salt Spray Res. | ASTM B117 | see attached |
| 28. VOC | | 1. 46.22 2. 168.13 |
| 29. Grain Raising | | **** Poor |

*Difficult to sand to smooth; some gumming

**Leaves tacky residue if not cleaned immediately after use

***Smooth; translucent

Produces a bronze discoloration when applied to Q-panels (within 10 min.)

****Left surface very rough on ponderosa pine

Note: Items 17, 21, 22 are qualitative tests.

Application properties: includes brush, roller, spray
(airless, conventional) as applicable.

15. Humidity Resistance

| | Size | Frequency | Pattern | Extent of Corrosion |
|---------------|------|-----------------|--------------------------|---------------------|
| 1. Blistering | 6 | Medium Dense | Uniform over field | - |
| 2. Corrosion | - | - | Uniform over field | Fairly extensive |

27. Salt Spray Resistance after 20 hours

| | Size | Frequency | Pattern | Extent of Corrosion |
|---------------|------|-----------|--|---|
| 1. Blistering | 6 | Dense | Uniform at both scribes | - |
| 2. Corrosion | - | - | Uniform at both scribes; random field corrosion | 1/4" from intersecting 1/2" from vertical scribe |

LABORATORY REPORT FORM

Contract # A4 166 48

Sample No. JFN #5
 Contract No. A5 097 48
 Date received: 7/11/86
 Log No.: 711 5A
 Lab code: 5L
 Quantity: 2 Qts.
 Test initiated: 7/11/86
 Test completed: 12/86

Chemist: R. Haffner

Product Category: 5. Lacquers

| Tests | Procedure | Results |
|---|-------------------|---------------------|
| 1. Total NV % Wt. | ASTM D2369 | 33.49 |
| 2. Wt. per Gallon | ASTM D1475 | 9.60 |
| 3. Viscosity Cps (Brookfield) | ASTM D2196 | 60 (1,100) |
| 4. Color (clear dries) | ASTM D1729 | N/A |
| 5. % Water | ASTM D1364 | 50.49 |
| 6. Stability 77°F (no skins, sed.) | ASTM D1849 | 60 (1,100) 3 months |
| 7. Stability 120°F | ASTM D1849 | 46.5 (1,100) |
| 8. Freeze - Thaw Res. 5,5 (All H ₂ O Based Products) | ASTM D2243 | 2800 (failed) |
| 9. Dry Time | ASTM D1640 | STT: 25 min. |
| 10. Hardness Q panel | ASTM D3363 | DH: 3 hrs 15 min |
| 11. Block Res. | STD 141B FTM 6216 | HB |
| 12. Sanding Prop | STD 141B FTM 6321 | 2 hrs |
| 13. 60° Gloss | ASTM D523 | * Excellent |
| 14. Yellowness Index | STD 141B 6131 | 100 |
| 15. Humidity Res. Q panel 48 hrs | ASTM D2247 | N/A (Dries, clear) |
| 16. Adhesion Q panel | ASTM D3359 | see attached |
| 17. H ₂ O Cleanup (All H ₂ O Based Products) | --- | 4 (metal) 5 (wood) |
| 18. Abrasion Res. | ASTM D4060 | Excellent |
| 19. Flexibility Q panel | ASTM D1737 | 0.11 gms |
| 20. Impact Res. Q panel | ASTM D2794 | 1/8" mandrel |
| 21. Appearance Clear, smooth | --- | 17.5 in/lbs |
| 22. Application Properties | --- | Good |
| 23. Sag Res. | ASTM D2801 | ** see below |
| 24. Levelling | ASTM D2801 | 3 |
| 25. Contrast Ratio | ASTM D2805 | 7 |
| 26. Acc. Weathering 300 hrs | ASTM G23, D822 | N/A (clear) |
| 27. Salt Spray Res. | ASTM B117 | ***80-see below |
| 28. VOC | | see attached |
| 29. Grain Raising (excessive on ponderosa pine) | | 1. 184.40 2. 439.67 |

* Ponderosa pine: sands smooth, slightly gummy
 ** Conventional spraying-good brushability-good
 ***Some isolated edge corrosion mil thickness 1.5
 Note: Items 17, 21, 22 are qualitative tests.

Application properties: includes brush, roller, spray
 (airless, conventional) as applicable.

15. Humidity Resistance

| | Size | Freq. | Pattern | Extent of Corrosion |
|---------------|------|-------|---|---------------------|
| 1. Blistering | None | -- | -- | -- |
| 2. Corrosion | -- | -- | Some isolated field corrosion and random edge corrosion | 3/8" from edge |

27. Salt Spray Resistance

| | Size | Freq. | Pattern | Extent of Corrosion |
|---------------|------|------------|--|-----------------------|
| 1. Blistering | 9 | Med. dense | Uniform over field | -- |
| 2. Corrosion | -- | -- | Uniform at both scribes; some isolated field corrosion | 1/2" from each scribe |

LABORATORY REPORT FORM

Contract # A4 166 48

Sample No. RDA -II-22-1
 Contract No. A5 097 48
 Date received: 3/14/86
 Log No.: 314-4A-4C
 Lab code: OS1
 Quantity: 1 Pt./2 Qts.
 Test initiated: 3/17/86
 Test completed: 12/86

Chemist: L. Kudela

Product Category: 6. Opaque Stains

| <u>Tests</u> | <u>Procedure</u> | <u>Results</u> |
|---|------------------|----------------------|
| 1. Total NV % Wt. | ASTM D2369 | 15.76% |
| 2. Wt. per Gallon | ASTM D1475 | 9.03 |
| 3. Viscosity Cps (Brookfield) | ASTM D2196 | 1250 cp #5 (20,50) |
| 4. % Water | ASTM D1364 | 70.54% |
| 5. Stability 77°F | ASTM D1849 | 2360 #5 (20,50) |
| 6. Stability 120°F | ASTM D1849 | 1950 cp #5 (20,50) |
| 7. Freeze - Thaw Res. (All H ₂ O Based Products) | ASTM D2243 | 1308 cp #5 (20,50) |
| 8. Dry Time | ASTM D1640 | STT: 11 min. |
| 9. Humidity Res. | ASTM D2247 | DH: 30 min. |
| 10. Adhesion | ASTM D3359 | passed (48 hrs) |
| 11. H ₂ O Cleanup (All H ₂ O Based Products) | --- | 5 (wood) |
| 12. Flexibility | ASTM D1737 | Very easy |
| 13. Appearance | --- | Pass 3/4" |
| 14. Application Properties | --- | Smooth |
| 15. Contrast Ratio | ASTM D2805 | Brush, spray-good |
| 16. Acc. Weathering | ASTM G23, D822 | 1.0 |
| 17. Bleed Res. | --- | Color change ΔE=1.49 |
| 18. H ₂ O Repellancy | ASTM D2921 | Good |
| 19. VOC | | Poor |
| 20. Grain Raising (ponderosa pine) | | 1. 148.33 2. 622.71 |
| | | Slight |

Note: Items 11, 13, 14 are qualitative tests.

Application properties: includes brush, roller, spray
 (airless, conventional) as applicable.

LABORATORY REPORT FORM

Contract # A4 166 48

Sample No. RDA -II-22-2
 Contract No. A5 097 48
 Date received: 3/14/86
 Log No.: 314-2A-2C
 Lab code: OS2
 Quantity: 1 Pt./2 Qts.
 Test initiated: 3/17/86
 Test completed: 12/86

Chemist: L. Kudela

Product Category: 6. Opaque Stains

| <u>Tests</u> | <u>Procedure</u> | <u>Results</u> |
|---|------------------|-----------------------------|
| 1. Total NV % Wt. | ASTM D2369 | 49.49 |
| 2. Wt. per Gallon | ASTM D1475 | 10.56 |
| 3. Viscosity Cps. (Brookfield) | ASTM D2196 | 1810 cp #5 (20/50) |
| 4. % Water | ASTM D1364 | 30.55% |
| 5. Stability 77°F | ASTM D1849 | 2750 cp #5 (20,50) |
| 6. Stability 120°F | ASTM D1849 | 2900 cp #5 (20,50) |
| 7. Freeze - Thaw Res. (All H ₂ O Based Products) | ASTM D2243 | 2114 cp #5 (20-50) |
| 8. Dry Time | ASTM D1640 | STT: 14 min. DH: 34 min. |
| 9. Humidity Res. | ASTM D2247 | Pass (48 hrs) in HC |
| 10. Adhesion | ASTM D3359 | 4 on wood |
| 11. H ₂ O Cleanup (All H ₂ O Based Products) | --- | Very easy |
| 12. Flexibility | ASTM D1737 | Pass 1/8" |
| 13. Appearance | --- | Smooth |
| 14. Application Properties | --- | Brush, spray-good |
| 15. Contrast Ratio | ASTM D2805 | 1.0 |
| 16. Acc. Weathering | ASTM G23, D822 | Color change E=0.71 |
| 17. Bleed Res. | --- | Fair |
| 18. H ₂ O Repellancy | ASTM D2921 | Poor |
| 19. VOC | | 1. 252.80 2. 410.99 |
| 20. Grain Raising | | Slight |

Note: Items 11, 13, 14 are qualitative tests.

Application properties: includes brush, roller, spray
 (airless, conventional) as applicable.

LABORATORY REPORT FORM

Contract # A4 166 48

Sample No. RDA -II-22-3
Contract No. A5 097 48
Date received: 3/14/86
Log No.: 314-1A-1C
Lab code: OS3
Quantity: 1 Pt./2 Qts.
Test initiated: 3/17/86
Test completed: 12/86

Chemist: L. Kudela

Product Category: 6. Opaque Stains

| <u>Tests</u> | <u>Procedure</u> | <u>Results</u> |
|---|------------------|-----------------------------|
| 1. Total NV % Wt. | ASTM D2369 | 50.48 |
| 2. Wt. per Gallon | ASTM D1475 | 11.12 |
| 3. Viscosity Cps (Brookfield) | ASTM D2196 | 2765 cp #5 (20/50) |
| 4. % Water | ASTM D1364 | 40.94% |
| 5. Stability 77°F | ASTM D1849 | 3342 cp #5 (20,50) |
| 6. Stability 120°F | ASTM D1849 | 3220 cp #5 (20,50) |
| 7. Freeze - Thaw Res. (All H ₂ O Based Products) | ASTM D2243 | 3054 #5(20,50) |
| 8. Dry Time | ASTM D1640 | STT: 13 min. DH: 40 min. |
| 9. Humidity Res. | ASTM D2247 | Pass (48 hrs in HC) |
| 10. Adhesion | ASTM D3359 | 5 (wood) |
| 11. H ₂ O Cleanup (All H ₂ O Based Products) | --- | Very easy |
| 12. Flexibility | ASTM D1737 | Pass 1/8" |
| 13. Appearance | --- | Smooth |
| 14. Application Properties | --- | Brush, spray-good |
| 15. Contrast Ratio | ASTM D2805 | 0.99 |
| 16. Acc. Weathering | ASTM G23, D822 | Color change- E=3.31 |
| 17. Bleed Res. | --- | Fair |
| 18. H ₂ O Repellancy | ASTM D2921 | Poor |
| 19. VOC | | 1. 114.44 2. 251.24 |
| 20. Grain Raising | | Excessive |

Note: Items 11, 13, 14 are qualitative tests.

Application properties: includes brush, roller, spray
(airless, conventional) as applicable.

LABORATORY REPORT FORM

Contract # A4 166 48

Sample No. RDA -II-22-4
 Contract No. A5 097 48
 Date received: 3/14/86
 Log No.: 314-6A-6C
 Lab code: OS4
 Quantity: 1 Pt./2 Qts.
 Test initiated: 3/17/86
 Test completed: 12/86

Chemist: L. Kudela

Product Category: 6. Opaque Stains

| <u>Tests</u> | <u>Procedure</u> | <u>Results</u> |
|---|------------------|---------------------|
| 1. Total NV % Wt. | ASTM D2369 | 45.63% |
| 2. Wt. per Gallon | ASTM D1475 | 11.12 |
| 3. Viscosity Cps (Brookfield) | ASTM D2196 | 3390 cp #5 (20,50) |
| 4. % Water | ASTM D1364 | 39.87 |
| 5. Stability 77°F | ASTM D1849 | 3490 cp #5 (20,50) |
| 6. Stability 120°F | ASTM D1849 | 3390 cp #5 (20,50) |
| 7. Freeze - Thaw Res. (All H ₂ O Based Products) | ASTM D2243 | 3456 cp #5 (20,50) |
| 8. Dry Time | ASTM D1640 | STT: 22 min. |
| 9. Humidity Res. | ASTM D2247 | DH: 46 min. |
| 10. Adhesion | ASTM D3359 | Pass (48 hrs) in HC |
| 11. H ₂ O Cleanup (All H ₂ O Based Products) | --- | 5 (wood) |
| 12. Flexibility | ASTM D1737 | Very easy |
| 13. Appearance | --- | Pass 1/8" |
| 14. Application Properties | --- | Smooth |
| 15. Contrast Ratio | ASTM D2805 | Brush, spray-good |
| 16. Acc. Weathering | ASTM G23, D822 | 0.99 |
| 17. Bleed Res. | | Color change E=1.26 |
| 18. H ₂ O Repellancy | ASTM D2921 | Fair |
| 19. VOC | | Good |
| 20. Grain Raising | | 1. 193.33 2. 411.51 |
| | | Slight |

Note: Items 11, 13, 14 are qualitative tests.

Application properties: includes brush, roller, spray
 (airless, conventional) as applicable.

LABORATORY REPORT FORM

Contract # A4 166 48

Sample No. RDA -II-22-5
Contract No. A5 097 48
Date received: 3/17/86
Log No.: 317-5A-5C
Lab code: OS5
Quantity: 1 Pt./ 2 Qts.
Test initiated: 3/18/86
Test completed: 12/86

Chemist: L. Kudela

Product Category: 6. Opaque Stains

| <u>Tests</u> | <u>Procedure</u> | <u>Results</u> |
|---|------------------|------------------------------|
| 1. Total NV % Wt. | ASTM D2369 | 36.95 |
| 2. Wt. per Gallon | ASTM D1475 | 9.82 |
| 3. Viscosity Cps (Brookfield) | ASTM D2196 | 1344 cp #5 (50,100) |
| 4. % Water | ASTM D1364 | 61.57% |
| 5. Stability 77°F | ASTM D1849 | 1486 cp #5 (50,100) |
| 6. Stability 120°F | ASTM D1849 | 1454 cp #5 (50,100) |
| 7. Freeze - Thaw Res. (All H ₂ O Based Products) | ASTM D2243 | 1446 cp #5 (50,100) |
| 8. Dry Time | ASTM D1640 | STT: 19 min. DH: 54 min. |
| 9. Humidity Res. | ASTM D2247 | Pass (48 hrs) in HC |
| 10. Adhesion | ASTM D3359 | 4 (wood) |
| 11. H ₂ O Cleanup (All H ₂ O Based Products) | --- | Very easy |
| 12. Flexibility | ASTM D1737 | Pass 1/8" |
| 13. Appearance | --- | Smooth |
| 14. Application Properties | --- | Brush, spray-good |
| 15. Contrast Ratio | ASTM D2805 | 1.0 |
| 16. Acc. Weathering | ASTM G23, D822 | Color change $\Delta E=2.52$ |
| 17. Bleed Res. | --- | Poor |
| 18. H ₂ O Repellancy | ASTM D2921 | Poor |
| 19. VOC | | 1. 17.43 2. 62.31 |
| 20. Grain Raising | | Excessive |

Note: Items 11, 13, 14 are qualitative tests.

Application properties: includes brush, roller, spray
(airless, conventional) as applicable.

LABORATORY REPORT FORM

Contract # A4 166 48

Sample No. RDA -II-22-6
 Contract No. A5 097 48
 Date received: 3/25/86
 Log No.: 325 1A-1C
 Lab code: OS7
 Quantity: 1 Pt./2 Qts.
 Test initiated: 3/25/86
 Test completed: 12/86

Chemist: L. Kudela

Product Category: 6. Opaque Stains

| <u>Tests</u> | <u>Procedure</u> | <u>Results</u> |
|---|------------------|----------------------|
| 1. Total NV % Wt. | ASTM D2369 | 28.74% |
| 2. Wt. per Gallon | ASTM D1475 | 8.96 |
| 3. Viscosity Cps (Brookfield) | ASTM D2196 | 725 cp #4 (50,100) |
| 4. % Water | ASTM D1364 | 71.26 |
| 5. Stability 77°F | ASTM D1849 | 685 cp #4 (50,100) |
| 6. Stability 120°F | ASTM D1849 | 720 cp #4 (50,100) |
| 7. Freeze - Thaw Res. (All H ₂ O Based Products) | ASTM D2243 | 652 cp #4 (50,100) |
| 8. Dry Time | ASTM D1640 | STT: 56 min. |
| 9. Humidity Res. | ASTM D2247 | DH: 150 min. |
| 10. Adhesion | ASTM D3359 | Pass (48 hrs) |
| 11. H ₂ O Cleanup (All H ₂ O Based Products) | --- | 5 (Wood) |
| 12. Flexibility | ASTM D1737 | Easy |
| 13. Appearance | --- | Pass 1/8" |
| 14. Application Properties | --- | Smooth |
| 15. Contrast Ratio | ASTM D2805 | Brush, spray-good |
| 16. Acc. Weathering | ASTM G23, D822 | 1.0 |
| 17. Bleed Res. | --- | Color change ΔE-10.5 |
| 18. H ₂ O Repellancy | ASTM D2921 | Poor |
| 19. VOC | | Poor |
| 20. Grain Raising | | 0 |
| | | Slight |

Note: Items 11, 13, 14 are qualitative tests.

Application properties: includes brush, roller, spray
 (airless, conventional) as applicable.

LABORATORY REPORT FORM

Contract # A4 166 48

Sample No. RDA -II-22-7
 Contract No. A5 097 48
 Date received: 3/25/86
 Log No.: 325 2A-2C
 Lab code: OS8
 Quantity: 1 Pt./2 Qts.
 Test initiated: 3/25/86
 Test completed: 12/86

Chemist: L. Kudela

Product Category: 6. Opaque Stains

| <u>Tests</u> | <u>Procedure</u> | <u>Results</u> |
|---|------------------|-----------------------|
| 1. Total NV % Wt. | ASTM D2369 | 58.81% |
| 2. Wt. per Gallon | ASTM D1475 | 11.62 lbs/gal |
| 3. Viscosity Cps (Brookfield) | ASTM D2196 | 3575 cp #4 (20,50) |
| 4. % Water | ASTM D1364 | 41.12 |
| 5. Stability 77°F | ASTM D1849 | 4081 cp #4 (20,50) |
| 6. Stability 120°F | ASTM D1849 | 3414 cp #4 (20,50) |
| 7. Freeze - Thaw Res. (All H ₂ O Based Products) | ASTM D2243 | 3679 cp #4 (20,50) |
| 8. Dry Time | ASTM D1640 | STT: 46 min. |
| 9. Humidity Res. | ASTM D2247 | DH: 103 min. |
| 10. Adhesion | ASTM D3359 | Pass (48 hrs) |
| 11. H ₂ O Cleanup (All H ₂ O Based Products) | --- | 5 wood |
| 12. Flexibility | ASTM D1737 | Easy |
| 13. Appearance | --- | Pass 1/8" |
| 14. Application Properties | --- | Smooth |
| 15. Contrast Ratio | ASTM D2805 | Brush, spray-good |
| 16. Acc. Weathering | ASTM G23, D822 | 1.0 |
| 17. Bleed Res. | --- | Color change- ΔE= 1.6 |
| 18. H ₂ O Repellancy | ASTM D2921 | Good |
| 19. VOC | | Poor |
| 20. Grain Raising | | 1. 0.98 2. 2.28 |
| | | Slight |

Note: Items 11, 13, 14 are qualitative tests.

Application properties: includes brush, roller, spray
 (airless, conventional) as applicable.

LABORATORY REPORT FORM

Contract # A4 166 48

Sample No. RDA -II-22-8
 Contract No. A5 097 48
 Date received: 3/20/86
 Log No.: 320-3A-3C
 Lab code: OS6
 Quantity: 1 Pt./2 Qts.
 Test initiated: 3/21/86
 Test completed: 12/86

Chemist: L. Kudela

Product Category: 6. Opaque Stains

| <u>Tests</u> | <u>Procedure</u> | <u>Results</u> |
|---|------------------|-----------------------|
| 1. Total NV % Wt. | ASTM D2369 | 69.46 |
| 2. Wt. per Gallon | ASTM D1475 | 10.15 lb/gal |
| 3. Viscosity Cps (Brookfield) | ASTM D2196 | 110 cp #1 (20,50) |
| 4. % Water | ASTM D1364 | 1.65 |
| 5. Stability 77°F | ASTM D1849 | 65.8 cp #1 (20,50) |
| 6. Stability 120°F | ASTM D1849 | 58.2 cp #1 (20,50) |
| 7. Freeze - Thaw Res. (All H ₂ O Based Products) | ASTM D2243 | N/A |
| 8. Dry Time | ASTM D1640 | STT: 48 min. |
| 9. Humidity Res. | ASTM D2247 | DH: 54 hrs. |
| 10. Adhesion | ASTM D3359 | Pass (48 hrs) |
| 11. H ₂ O Cleanup (All H ₂ O Based Products) | --- | 5 (wood) |
| 12. Flexibility | ASTM D1737 | Solvent based |
| 13. Appearance | --- | Pass 1/8" |
| 14. Application Properties | --- | Smooth |
| 15. Contrast Ratio | ASTM D2805 | Brush, spray-good |
| 16. Acc. Weathering | ASTM G23, D822 | 1.0 |
| 17. Bleed Res. | --- | Color change-Δ E=2.05 |
| 18. H ₂ O Repellancy | ASTM D2921 | Poor |
| 19. VOC | | Good |
| 20. Grain Raising | | 1. 351.17 2. 358.30 |
| | | None |

Note: Items 11, 13, 14 are qualitative tests.

Application properties: includes brush, roller, spray
 (airless, conventional) as applicable.

LABORATORY REPORT FORM

Contract # A4 166 48

Sample No. RDA -II-22-9
 Contract No. A5 097 48
 Date received: 4/10/86
 Log No.: 410 5A-5C
 Lab code: OS9
 Quantity: 1 pt./2 qts.
 Test initiated: 8/15/86
 Test completed: 12/86

Chemist: L. Kudela

Product Category: 6. Opaque Stains

| <u>Tests</u> | <u>Procedure</u> | <u>Results</u> |
|---|------------------|------------------------------|
| 1. Total NV % Wt. | ASTM D2369 | <u>58.03%</u> |
| 2. Wt. per Gallon | ASTM D1475 | <u>11.38 lbs/gal</u> |
| 3. Viscosity Cps (Brookfield) | ASTM D2196 | <u>1812.5 cp #3 (20,50)</u> |
| 4. % Water | ASTM D1364 | <u>34.71%</u> |
| 5. Stability 77°F | ASTM D1849 | <u>897 cp #3 (20,50)</u> |
| 6. Stability 120°F | ASTM D1849 | <u>1640.51 cp #3 (20,50)</u> |
| 7. Freeze - Thaw Res. (All H ₂ O Based Products) | ASTM D2243 | <u>1696 cp #3 (20,50)</u> |
| 8. Dry Time | ASTM D1640 | <u>STT: 30 min.</u> |
| 9. Humidity Res. | ASTM D2247 | <u>DH: 65 min.</u> |
| 10. Adhesion | ASTM D3359 | <u>Pass 48 hrs.</u> |
| 11. H ₂ O Cleanup (All H ₂ O Based Products) | --- | <u>5 wood</u> |
| 12. Flexibility | ASTM D1737 | <u>Easy</u> |
| 13. Appearance | --- | <u>Pass 1/8"</u> |
| 14. Application Properties | --- | <u>Smooth</u> |
| 15. Contrast Ratio | ASTM D2805 | <u>Brush, spray-good</u> |
| 16. Acc. Weathering | ASTM G23, D822 | <u>1.00</u> |
| 17. Bleed Res. | --- | <u>Color change ΔE= 1.72</u> |
| 18. H ₂ O Repellancy | ASTM D2921 | <u>Good</u> |
| 19. VOC | | <u>Poor</u> |
| 20. Grain Raising | | <u>1. 97.83 2. 185.28</u> |
| | | <u>Slight</u> |

Note: Items 11, 13, 14 are qualitative tests.

Application properties: includes brush, roller, spray
 (airless, conventional) as applicable.

LABORATORY REPORT FORM

Contract # A4 166 48

Sample No. JFN #6
 Contract No. A5 097 48
 Date received: 7/11/86
 Log No.: 711 6A-6B
 Lab code: OS10
 Quantity: 2 qts.
 Test initiated: 7/15/86
 Test completed: 12/86

Chemist: L. Kudela

Product Category: 6. Opaque Stains

| <u>Tests</u> | <u>Procedure</u> | <u>Results</u> |
|---|------------------|-----------------------|
| 1. Total NV % Wt. | ASTM D2369 | 32.37% |
| 2. Wt. per Gallon | ASTM D1475 | 9.30 |
| 3. Viscosity Cps (Brookfield) | ASTM D2196 | 326 cp #3 (50,100) |
| 4. % Water | ASTM D1364 | 69.10 |
| 5. Stability 77°F | ASTM D1849 | 258 cp #3 (50,100) |
| 6. Stability 120°F | ASTM D1849 | 191.5 cp #3 (50,100) |
| 7. Freeze - Thaw Res. (All H ₂ O Based Products) | ASTM D2243 | 521 cp #3 (50,100) |
| 8. Dry Time | ASTM D1640 | STT: 25 min. |
| 9. Humidity Res. | ASTM D2247 | DH: 56 min. |
| 10. Adhesion | ASTM D3359 | Pass 48 hrs. |
| 11. H ₂ O Cleanup (All H ₂ O Based Products) | --- | 5 wood |
| 12. Flexibility | ASTM D1737 | Easy |
| 13. Appearance | --- | Pass 1/8" |
| 14. Application Properties | --- | Smooth |
| 15. Contrast Ratio | ASTM D2805 | Brush, spray-Good |
| 16. Acc. Weathering | ASTM G23, D822 | 0.975 |
| 17. Bleed Res. | --- | Color change ΔE= 1.12 |
| 18. H ₂ O Repellancy | ASTM D2921 | Good |
| 19. VOC | | Good |
| 20. Grain Raising | | 1. 16.39 2. 70.34 |
| | | None |

Note: Items 11, 13, 14 are qualitative tests.

Application properties: includes brush, roller, spray
 (airless, conventional) as applicable.

LABORATORY REPORT FORM

Contract # A4 166 48

Sample No. JFN #8
 Contract No. A5 097 48
 Date received: 7/11/86
 Log No.: 711 8A-8B
 Lab code: OS11
 Quantity: 2 qts.
 Test initiated: 7/15/86
 Test completed: 12/86

Chemist: L. Kudela

Product Category: 6. Opaque Stains

| <u>Tests</u> | <u>Procedure</u> | <u>Results</u> |
|---|------------------|--------------------------------|
| 1. Total NV % Wt. | ASTM D2369 | 34.01 |
| 2. Wt. per Gallon | ASTM D1475 | 9.20 |
| 3. Viscosity Cps (Brookfield) | ASTM D2196 | 237.6 cp #2 (50/100) |
| 4. % Water | ASTM D1364 | 56.13 |
| 5. Stability 77°F | ASTM D1849 | 237.0 cp #2 (50,100) |
| 6. Stability 120°F | ASTM D1849 | * 313.0 cp #2 (50,100) |
| 7. Freeze - Thaw Res. (All H ₂ O Based Products) | ASTM D2243 | 236 cp #2 (50,100) |
| 8. Dry Time | ASTM D1640 | STT: 17 min. |
| 9. Humidity Res. | ASTM D2247 | DH: 40 min. |
| 10. Adhesion | ASTM D3359 | Pass |
| 11. H ₂ O Cleanup (All H ₂ O Based Products) | --- | 5 wood |
| 12. Flexibility | ASTM D1737 | Easy |
| 13. Appearance | --- | Pass 1/8" |
| 14. Application Properties | --- | Smooth |
| 15. Contrast Ratio | ASTM D2805 | Spray, brush-Good |
| 16. Acc. Weathering | ASTM G23, D822 | 0.904 |
| 17. Bleed Res. | --- | Color change $\Delta E = 4.02$ |
| 18. H ₂ O Repellancy | ASTM D2921 | Fair |
| 19. VOC | | Good |
| 20. Grain Raising | | 1. 108.76 2. 284.26 |
| | | Slight |

*Gummy settle

Note: Items 11, 13, 14 are qualitative tests.

Application properties: includes brush, roller, spray
 (airless, conventional) as applicable.

LABORATORY REPORT FORM

Contract # A4 166 48

Sample No. RDA -II-23-1
 Contract No. A5 097 48
 Date received: 3/20/86
 Log No.: 320 4A-4C
 Lab code: 029-7-00
 Quantity: 1 Pt./2 Qts.
 Test initiated: 3/21/86
 Test completed: 12/86

Chemist: E. Khan
 R. Haffner

Product Category: 7. Opaque Wood Preservatives

| Tests | Procedure | Results |
|---|-------------------|--|
| 1. Total NV % Wt. | ASTM D2369 | 47.6% |
| 2. Wt. per Gallon | ASTM D1475 | 9.02 |
| 3. Viscosity Cps (Brookfield) | ASTM D2196 | 44 cp (2,100) |
| 4. % Water | ASTM D1364 | 1.12% |
| 5. Stability 77°F | ASTM D1849 | 44 (2,100) |
| 6. Stability 120°F | ASTM D1849 | 42 cps (2,100) |
| 7. Freeze - Thaw Res. (All H ₂ O Based Products) | ASTM D2243 | N/A |
| 8. Dry Time | ASTM D1640 | *Remains tacky |
| 9. Humidity Res. | ASTM D2247 | No blisters, slight change in color |
| 10. Adhesion | ASTM D3359 | Wood- 5.0 |
| 11. H ₂ O Cleanup (All H ₂ O Based Products) | --- | Solvent based |
| 12. Flexibility | ASTM D1737 | Passes 1/8" mandrel |
| 13. Appearance | --- | Smooth |
| 14. Application Properties | --- | **Brushable |
| 15. Contrast Ratio | ASTM D2805 | 0.225 |
| 16. Acc. Weathering | ASTM G23, D822 | *** see below |
| 17. H ₂ O Repellancy | ASTM D2921 | Fair |
| 18. VOC | | 554.59 |
| 19. Grain Raising | | Slight |
| 20. Fungus Res. | STD 141B FTM 6271 | Poor |

*After 48 hours

**Clogs spray gun

***Stain is bleaching out, some warpage of ponderosa pine

Note: material contains lumps and grit, rendering uneven distribution
 Strong creosote odor

Note: Items 11, 13, 14 are qualitative tests.

Application properties: includes brush, roller, spray
 (airless, conventional) as applicable.

LABORATORY REPORT FORM

Contract # A4 166 48

Sample No. RDA -II-23-2
 Contract No. A5 097 48
 Date received: 4/23/86
 Log No.: 423 2A-2C
 Lab code: 055-7
 Quantity: 1 Pt./2 Qts.
 Test initiated: 4/25/86
 Test completed: 12/86

Chemist: A. Khan
 R. Haffner

Product Category: 7. Opaque Wood Preservatives

| <u>Tests</u> | <u>Procedure</u> | <u>Results</u> |
|---|-------------------|-----------------------|
| 1. Total NV % Wt. | ASTM D2369 | 49.9 |
| 2. Wt. per Gallon | ASTM D1475 | 8.47 |
| 3. Viscosity Cps (Brookfield) | ASTM D2196 | 132 (2,100) |
| 4. % Water | ASTM D1364 | 1.05% |
| 5. Stability 77°F | ASTM D1849 | * 130 (2,100) |
| 6. Stability 120°F | ASTM D1849 | 126 cps (2,100) |
| 7. Freeze - Thaw Res. (All H ₂ O Based Products) | ASTM D2243 | N/A |
| 8. Dry Time | ASTM D1640 | STT: 1hr. 50min. |
| 9. Humidity Res. | ASTM D2247 | DH: 2 hrs 15min. |
| | | No blisters |
| | | but discolored |
| 10. Adhesion | ASTM D3359 | 5 (on wood) |
| 11. H ₂ O Cleanup (All H ₂ O Based Products) | --- | N/A |
| 12. Flexibility | ASTM D1737 | Passed 1/8" mandrel |
| 13. Appearance | --- | Slightly rough |
| 14. Application Properties | --- | Brushable, spray good |
| 15. Contrast Ratio | ASTM D2805 | 0.063-clear |
| 16. Acc. Weathering | ASTM G23, D822 | ** see below |
| 17. H ₂ O Repellancy | ASTM D2921 | Excellent |
| 18. VOC | | 1. 498.13 2. 503.46 |
| 19. Grain Raising | | Very slight |
| 20. Fungus Res. | STD 141B FTM 6271 | Fair |

*Soft settle, easy disp.

**Stain is whitening, a great deal of warpage occurs with ponderosa pine

Note: Items 11, 13, 14 are qualitative tests.

Application properties: includes brush, roller, spray
 (airless, conventional) as applicable.

LABORATORY REPORT FORM

Contract # A4 166 48

Sample No. RDA -II-23-3

Contract No. A5 097 48

Date received: 5/9/86

Log No.: 59 1A-1C

Lab code: 058-7

Quantity: 1 Pt./2 Qts.

Test initiated: 5/12/86

Test completed: 12/86

Chemist: A. Khan

R. Haffner

Product Category: 7. Opaque Wood Preservatives

| Tests | Procedure | Results |
|---|-------------------|------------------------|
| 1. Total NV % Wt. | ASTM D2369 | 28.56 |
| 2. Wt. per Gallon | ASTM D1475 | 7.95 |
| 3. Viscosity Cps (Brookfield) | ASTM D2196 | 74.0 (2,100) |
| 4. % Water | ASTM D1364 | 3.94 |
| 5. Stability 77°F | ASTM D1849 | 76 (2,100) |
| 6. Stability 120°F | ASTM D1849 | 35 (2,100) |
| 7. Freeze - Thaw Res. (All H ₂ O Based Products) | ASTM D2243 | Solvent based |
| 8. Dry Time | ASTM D1640 | STT: 8 hrs. |
| 9. Humidity Res. | ASTM D2247 | DH: 18 hrs. |
| 10. Adhesion | ASTM D3359 | * Blisters; see below |
| 11. H ₂ O Cleanup (All H ₂ O Based Products) | --- | 5 |
| 12. Flexibility | ASTM D1737 | Oil based |
| 13. Appearance | --- | Passes 1/8" mandrel |
| 14. Application Properties | --- | Flat |
| 15. Contrast Ratio | ASTM D2805 | Brushable; sprays good |
| 16. Acc. Weathering | ASTM G23, D822 | 0.82 |
| 17. H ₂ O Repellancy | ASTM D2921 | ** see below |
| 18. VOC | | Good |
| 19. Grain Raising | | 1. 643.41 2. 668.40 |
| 20. Fungus Res. | STD 141B FTM 6271 | Very slight |
| | | Excellent |

*Size 8, medium dense, uniform

**Left white residue on ponderosa pine, no warpage of wood.

Note: Items 11, 13, 14 are qualitative tests.

Application properties: includes brush, roller, spray
(airless, conventional) as applicable.

LABORATORY REPORT FORM

Contract # A4 166 48

Sample No. JFN #13
 Contract No. A5 097 48
 Date received: 10/15/86
 Log No.: 1015-1A
 Lab code: PWP7
 Quantity: 1 gal.
 Test initiated: 10/15/86
 Test completed: 12/86

Chemist: R. Haffner

Product Category: 7. Opaque Wood Preservatives

| Tests | Procedure | Results |
|---|-------------------|---|
| 1. Total NV % Wt. | ASTM D2369 | 37.89 |
| 2. Wt. per Gallon | ASTM D1475 | 9.79 |
| 3. Viscosity Cps (Brookfield) | ASTM D2196 | 1176 (2,20) |
| 4. % Water | ASTM D1364 | 57.92 |
| 5. Stability 77°F | ASTM D1849 | - |
| 6. Stability 120°F | ASTM D1849 | 1115 (2,20) Pass |
| 7. Freeze - Thaw Res. (All H ₂ O Based Products) | ASTM D2243 | 870 (2,20) |
| 8. Dry Time | ASTM D1640 | STT: 1 hr. 5 min. DH: 2 hrs. 45 min. |
| 9. Humidity Res. | ASTM D2247 | * see below |
| 10. Adhesion | ASTM D3359 | 5 |
| 11. H ₂ O Cleanup (All H ₂ O Based Products) | --- | Good |
| 12. Flexibility | ASTM D1737 | 80.5 in. lbs. |
| 13. Appearance | --- | Smooth |
| 14. Application Properties | --- | ** see below |
| 15. Contrast Ratio | ASTM D2805 | 1.0 |
| 16. Acc. Weathering | ASTM G23, D822 | ***see below |
| 17. H ₂ O Repellancy | ASTM D2921 | Fair |
| 18. VOC | | 1. 44.32 2. 137.46 |
| 19. Grain Raising (ponderosa pine) | | ****see below |
| 20. Fungus Res. | STD 141B FTM 6271 | Fair |

*Whitish exudation on ponderosa pine.

**Brush excellent, spray 10% reduction H₂O

***Slight whitish residue on ponderosa pine, cracking and warpage
 Fair-leaves surface slightly rough on ponderosa pine

****Fair; leaves surface slightly rough on ponderosa pine

Note: Items 11, 13, 14 are qualitative tests.

Application properties: includes brush, roller, spray
 (airless, conventional) as applicable.

LABORATORY REPORT FORM

Contract # A4 166 48

Sample No. RDA -II-24-2
 Contract No. A5 097 48
 Date received: 3/17/86
 Log No.: 317 4A-4C
 Lab code: QDE8
 Quantity: 1 Pt./2 Qts.
 Test initiated: 3/20/86
 Test completed: 12/86

Chemist: B. Haffner

Product Category: 8. Q. D. Enamels

| Tests | Procedure | Results |
|---|-----------------------|------------------------|
| 1. Total NV % Wt. | ASTM D2369 | 45.30 |
| 2. Wt. per Gallon | ASTM D1475 | 9.978 |
| 3. Viscosity Cps (Brookfield) | ASTM D2196 | 1370 (3,20) |
| 4. % Water | ASTM D1364 | 25.08 |
| 5. Stability 77°F | ASTM D1849 | * 1575 (3,20) |
| 6. Stability 120°F | ASTM D1849 | 1575 (3,20) |
| 7. Freeze - Thaw Res.visc. (All H ₂ O Based Products) | ASTM D2243 | 1150 (3,50) |
| 8. Dry Time Q panels | ASTM D1640 | STT: 25 min. |
| 9. Hardness | ASTM D3363 | DH: 2 hrs. |
| 10. Block Res. | STD 141B FTM 6216 | HB |
| 11. 60° Gloss | ASTM D523 | 2 Hrs. 40 min. |
| 12. Yellowness Index | STD 141B 6131 (96hrs) | 77 |
| 13. Humidity Res. | ASTM D2247 | n= .0085 |
| 14. Adhesion | ASTM D3359 | See attached chart |
| 15. H ₂ O Cleanup (All H ₂ O Based Products) | --- | 3 |
| 16. Abrasion Res. | ASTM D4060 | Good-excellent |
| 17. Flexibility | ASTM D1737 | 0.066 gms |
| 18. Impact Res. | ASTM D2794 | 1/8" mandrel |
| 19. Appearance | --- | 84.0 in. lbs. |
| 20. Application Properties (Conv.) | --- | Excellent, very glossy |
| 21. Sag Res. | ASTM D2801 | Brushes exc. |
| 22. Levelling | ASTM D2801 | Spraying good |
| 23. Contrast Ratio | ASTM D2805 | 6 mils |
| 24. Acc. Weathering (300 hrs) 60° specular gloss | ASTM G23, D822 | 6 |
| 25. Salt Spray Res. (200 hrs) | ASTM B117 | 0.96 |
| 26. VOC | | 42 |
| | | See attached |
| | | 1. 354.50 2. 505.27 |

*No skins, sed.

Note: Items 15, 19, 20 are qualitative tests.

Application properties: includes brush, roller, spray
 (airless, conventional) as applicable.

13. Humidity Resistance

| | Size | Frequency | Pattern | Extent of Corrosion |
|---------------|------|-----------|---|---------------------|
| 1. Blistering | -- | None | -- | -- |
| 2. Corrosion | -- | -- | Very little random isolated field corrosion | |

25. Salt Spray Resistance

| | Size | Frequency | Pattern | Extent of Corrosion |
|---------------|------|--------------|--|--|
| 1. Blistering | 6 | Medium dense | Uniform at both scribes and over field | |
| 2. Corrosion | -- | -- | Uniform at both scribes and over | 1" inch from both scribes; very extensive field corrosion |

LABORATORY REPORT FORM

Contract # A4 166 48

Sample No. RDA -II-24-4
 Contract No. A5 097 48
 Date received: 3/18/86
 Log No.: 318 5A-5C
 Lab code: QDE8
 Quantity: 1 Pt./2 Qts.
 Test initiated: 3/20/86
 Test completed: 12/86

Chemist: B. Haffner

Product Category: 8. Q. D. Enamels

| Tests | Procedure | Results |
|---|-----------------------|---------------------|
| 1. Total NV % Wt. | ASTM D2369 | 50.68 |
| 2. Wt. per Gallon | ASTM D1475 | 10.84 |
| 3. Viscosity Cps (Brookfield) | ASTM D2196 | 2600 (3,20) |
| 4. % Water | ASTM D1364 | 28.62 |
| 5. Stability 77°F lumps,gritty | ASTM D1849 | * 2250 (3,20) |
| 6. Stability 120°F | ASTM D1849 | 2550 (3,20) |
| 7. Freeze - Thaw Res. (All H ₂ O Based Products) | ASTM D2243 | 2463 Pass (3,20) |
| 8. Dry Time Q panel | ASTM D1640 | STT: 15 min. |
| 9. Hardness | ASTM D3363 | DH: 1 hr |
| 10. Block Res. | STD 141B FTM 6216 | HB |
| 11. 60° Gloss | ASTM D523 | 2 hrs. |
| 12. Yellowness Index(difference) | STD 141B 6131 (96hrs) | 7 Q panel |
| 13. Humidity Res. | ASTM D2247 | n= .0023 |
| 14. Adhesion | ASTM D3359 | See attached |
| 15. H ₂ O Cleanup (All H ₂ O Based Products) | --- | 0 |
| 16. Abrasion Res. | ASTM D4060 | Good-excellent |
| 17. Flexibility | ASTM D1737 | 0.183 gms |
| 18. Impact Res. | ASTM D2794 | 1/8" mandrel |
| 19. Appearance | --- | 38.5 in. lbs. |
| 20. Application Properties (conv) | --- | Little gloss-fair |
| 21. Sag Res. | ASTM D2801 | Brushes good, |
| 22. Levelling | ASTM D2801 | spraying fair |
| 23. Contrast Ratio | ASTM D2805 | 8 mils |
| 24. Acc. Weathering (300 hrs) 60° specular gloss | ASTM G23, D822 | 4 |
| 25. Salt Spray Res. (200 hours) | ASTM B117 | 0.97 |
| 26. VOC | | 7 |
| | | See attached |
| | | 1. 268.91 2. 426.23 |

*No skins, some sediment, gritty

Note: Items 15, 19, 20 are qualitative tests.

Application properties: includes brush, roller, spray
 (airless, conventional) as applicable.

13. Humidity Resistance

| | Size | Frequency | Pattern | Extent of Corrosion |
|---------------|------|-----------|---------------------------------|---------------------|
| 1. Blistering | | None | | |
| 2. Corrosion | -- | -- | Random isolated field corrosion | Some edge corrosion |

25. Salt Spray Resistance

| | Size | Frequency | Pattern | Extent of Corrosion |
|---------------|------|-----------|---|---|
| 1. Blistering | 4 | Medium | Uniform at both scribes; random over field | |
| 2. Corrosion | -- | -- | Uniform along both scribes; random over field | 3/8" from both scribes very extensive field corrosion |

LABORATORY REPORT FORM

Contract # A4 166 48

Sample No. RDA -II-24-6
 Contract No. A5 097 48
 Date received: 3/20/86
 Log No.: 320 5A-5C
 Lab code: QDE8
 Quantity: 1 Pt./2 Qts.
 Test initiated: 3/21/86
 Test completed: 12/86

Chemist: B. Haffner

Product Category: 8. Q. D. Enamels

| <u>Tests</u> | <u>Procedure</u> | <u>Results</u> |
|---|-------------------|---------------------------|
| 1. Total NV % Wt. | ASTM D2369 | <u>59.55</u> |
| 2. Wt. per Gallon | ASTM D1475 | <u>9.32</u> |
| 3. Viscosity Cps (Brookfield) | ASTM D2196 | <u>1725 (3,50)</u> |
| 4. % Water | ASTM D1364 | <u>0.06</u> |
| 5. Stability 77°F | ASTM D1849 | <u>* 2125 (3,50)</u> |
| 6. Stability 120°F | ASTM D1849 | <u>* 5100 (3,10)</u> |
| 7. Freeze - Thaw Res. (All H ₂ O Based Products) | ASTM D2243 | <u>N/A</u> |
| 8. Dry Time Q panel | ASTM D1640 | <u>STT: 1 hr. 45 min.</u> |
| 9. Hardness | ASTM D3363 | <u>DH: 7 hrs. 30 min.</u> |
| 10. Block Res. | STD 141B FTM 6216 | <u>HB</u> |
| 11. 60° Gloss | ASTM D523 | <u>16 hrs.</u> |
| 12. Yellowness Index (difference) | STD 141B 6131 | <u>84 Q panel</u> |
| 13. Humidity Res. | ASTM D2247 | <u>n= .0019 (96 hrs)</u> |
| 14. Adhesion | ASTM D3359 | <u>See attached chart</u> |
| 15. H ₂ O Cleanup (All H ₂ O Based Products) | --- | <u>4</u> |
| 16. Abrasion Res. | ASTM D4060 | <u>Oil based (N/A)</u> |
| 17. Flexibility | ASTM D1737 | <u>0.096 gms</u> |
| 18. Impact Res. | ASTM D2794 | <u>1/8" mandrel</u> |
| 19. Appearance | --- | <u>84 in. lbs</u> |
| 20. Application Properties (Conv.) | --- | <u>Exc-smooth finish</u> |
| 21. Sag Res. | ASTM D2801 | <u>Very glossy</u> |
| 22. Levelling | ASTM D2801 | <u>** See below</u> |
| 23. Contrast Ratio | ASTM D2805 | <u>5 mils</u> |
| 24. Acc. Weathering (300 hrs) 60° specular gloss | ASTM G23, D822 | <u>7</u> |
| 25. Salt Spray Res. (140 hrs) | ASTM B117 | <u>0.97</u> |
| 26. VOC | | <u>61</u> |
| | | <u>See attached</u> |
| | | <u>452.00</u> |

*No skins, sed.
 **Reduced with 5% by volume, 1,1,1 Trichloroethane
 Brushing exc., spraying good

Note: Items 15, 19, 20 are qualitative tests.

Application properties: includes brush, roller, spray
 (airless, conventional) as applicable.

13. Humidity Resistance

| | Size | Frequency | Pattern | Extent of Corrosion |
|---------------|------|--------------|--------------------|---------------------|
| 1. Blistering | 6 | Medium dense | Uniform over field | -- |
| 2. Corrosion | -- | Few | Random | |

25. Salt Spray Resistance

| | Size | Frequency | Pattern | Extent of Corrosion |
|---------------|------|-----------|--|---|
| 1. Blistering | 8 | Medium | Uniform at both scribes uniform over field | |
| 2. Corrosion | -- | -- | Uniform at both scribes; uniform over field | 1/8" inch from both scribes, slight isolated field corrosion |

LABORATORY REPORT FORM

Contract # A4 166 48

Sample No. RDA -II-24-7
 Contract No. A5 097 48
 Date received: 3/20/86
 Log No.: 320 2A-2C
 Lab code: QDE8
 Quantity: 1 Pt./2 Qts.
 Test initiated: 3/21/86
 Test completed: 12/86

Chemist: B. Haffner

Product Category: 8. Q. D. Enamels

| Tests | Procedure | Results |
|---|-------------------|------------------------------|
| 1. Total NV % Wt. | ASTM D2369 | 59.29 |
| 2. Wt. per Gallon | ASTM D1475 | 9.29 |
| 3. Viscosity Cps (Brookfield) | ASTM D2196 | 2500 (3,20) |
| 4. % Water | ASTM D1364 | 0.25 |
| 5. Stability 77°F | ASTM D1849 | * 2475 (3,20) |
| 6. Stability 120°F | ASTM D1849 | * 3100 (3,20) |
| 7. Freeze - Thaw Res. (All H ₂ O Based Products) | ASTM D2243 | N/A |
| 8. Dry Time Q panel | ASTM D1640 | STT: 1 hr. 10 min. |
| 9. Hardness | ASTM D3363 | DH: 6 hrs.20 min. |
| 10. Block Res. | STD 141B FTM 6216 | HB |
| 11. 60° Gloss | ASTM D523 | 11 hrs. |
| 12. Yellowness Index | STD 141B 6131 | 16 Q panel |
| 13. Humidity Res. | ASTM D2247 | N/A (black) |
| 14. Adhesion | ASTM D3359 | See attached chart |
| 15. H ₂ O Cleanup (All H ₂ O Based Products) | --- | 5 |
| 16. Abrasion Res. | ASTM D4060 | Oil based (N/A) |
| 17. Flexibility | ASTM D1737 | 0.120 gms |
| 18. Impact Res. | ASTM D2794 | 1/8" mandrel |
| 19. Appearance | --- | 84 in. lbs. |
| 20. Application Properties (Conv.) | --- | Good, semi-gloss |
| 21. Sag Res. | ASTM D2801 | ** Brushes exc., sprays good |
| 22. Levelling | ASTM D2801 | 9 mils |
| 23. Contrast Ratio | ASTM D2805 | 4 |
| 24. Acc. Weathering (300 hrs) 60° specular gloss | ASTM G23, D822 | 1.0 |
| 25. Salt Spray Res. (140 hrs) | ASTM B117 | 6 |
| 26. VOC | | See attached |
| | | 451.00 |

* No skins, sed.

** Reduced with 5% by volume, 1,1,1 Trichlorethane

Note: Items 15, 19, 20 are qualitative tests.

Application properties: includes brush, roller, spray
 (airless, conventional) as applicable.

13. Humidity Resistance

| | Size | Frequency | Pattern | Extent of Corrosion |
|---------------|------|--------------|--|---------------------|
| 1. Blistering | 6 | Medium dense | Random over field | -- |
| 2. Corrosion | -- | -- | Random over field; some edge corrosion | -- |

25. Salt Spray Resistance

| | Size | Frequency | Pattern | Extent of Corrosion |
|---------------|------|-----------|---|--|
| 1. Blistering | 6 | Few | Random along both scribes; random over field | -- |
| 2. Corrosion | -- | -- | Uniform along both scribes; random isolated field corrosion | 1/4" from both scribes; very little isolated field corrosion |

LABORATORY REPORT FORM

Contract # A4 166 48

Sample No. RDA -II-24-8
 Contract No. A5 097 48
 Date received: 3/21/86
 Log No.: 321 2A-2C
 Lab code: QDE8
 Quantity: 1 Pt./2 Qts.
 Test initiated: 3/24/86
 Test completed: 12/86

Chemist: B. Haffner

Product Category: 8. Q. D. Enamels

| <u>Tests</u> | <u>Procedure</u> | <u>Results</u> |
|---|------------------|---|
| 1. Total NV % Wt. | ASTM D2369 | <u>55.75</u> |
| 2. Wt. per Gallon | ASTM D1475 | <u>8.758</u> |
| 3. Viscosity Cps (Brookfield) | ASTM D2196 | <u>990 (3,50)</u> |
| 4. % Water | ASTM D1364 | <u>0.60</u> |
| 5. Stability 77°F | ASTM D1849 | * <u>1000 (3,50)</u> |
| 6. Stability 120°F (no skins, sed) | ASTM D1849 | <u>1320 (3,50)</u> |
| 7. Freeze - Thaw Res. (All H ₂ O Based Products) | ASTM D2243 | <u>N/A</u> |
| 8. Dry Time Q panel | ASTM D1640 | STT: 1 hr. 30 min. DH: <u>7 hrs.</u> |
| 9. Hardness | ASTM D3363 | <u>HB</u> |
| 10. Block Res. STD 141B FTM 6216 | | <u>15 hrs.</u> |
| 11. 60° Gloss | ASTM D523 | <u>86 Q panel</u> |
| 12. Yellowness Index (difference) STD 141B 6131 (96hrs) | | <u>n= .0013 (96 hrs)</u> |
| 13. Humidity Res. | ASTM D2247 | <u>See attached</u> |
| 14. Adhesion | ASTM D3359 | <u>4</u> |
| 15. H ₂ O Cleanup (All H ₂ O Based Products) | --- | <u>Oil based (N/A)</u> |
| 16. Abrasion Res. | ASTM D4060 | <u>0.130 gms</u> |
| 17. Flexibility | ASTM D1737 | <u>1/8" mandrel</u> |
| 18. Impact Res. | ASTM D2794 | <u>> 84 inch-lbs.</u> |
| 19. Appearance | --- | <u>Exc. very smooth, glossy</u> |
| 20. Application Properties (Conv.) --- ** | | <u>Brush exc., sprays good</u> |
| 21. Sag Res. | ASTM D2801 | <u>6 mils</u> |
| 22. Levelling | ASTM D2801 | <u>6</u> |
| 23. Contrast Ratio | ASTM D2805 | <u>0.98</u> |
| 24. Acc. Weathering (300 hrs) 60° specular gloss | ASTM G23, D822 | <u>67</u> |
| 25. Salt Spray Res. (140 hrs) | ASTM B117 | <u>See attached</u> |
| 26. VOC | | <u>465.00</u> |

*No skins, sed.

** reduced with 5% by volume, 1,1,1 Trichloroethane prior to spraying

Note: Items 15, 19, 20 are qualitative tests.

Application properties: includes brush, roller, spray
 (airless, conventional) as applicable.

13. Humidity Resistance

| | Size | Frequency | Pattern | Extent of Corrosion |
|---------------|------|-----------|---|---------------------|
| 1. Blistering | 8 | Medium | Random over field | -- |
| 2. Corrosion | -- | -- | Random isolated field corrosion; some edge corrosion | -- |

25. Salt Spray Resistance

| | Size | Frequency | Pattern | Extent of Corrosion |
|---------------|------|-----------|---|---|
| 1. Blistering | 2 | Medium | Uniform along scribe | -- |
| | 8 | Few | Uniform over field | -- |
| 2. Corrosion | -- | -- | Uniform along scribes; random isolated field corrosion | 1/8" from both scribes; very little isolated field corrosion |

LABORATORY REPORT FORM

Contract # A4 166 48

Sample No. RDA -II-24-9
 Contract No. A5 097 48
 Date received: 3/25/86
 Log No.: 325 4A-4C
 Lab code: QDE8
 Quantity: 1 Pt./2 Qts.
 Test initiated: 3/25/86
 Test completed: 12/86

Chemist: B. Haffner

Product Category: 8. Q. D. Enamels

| <u>Tests</u> | <u>Procedure</u> | <u>Results</u> |
|---|-------------------|----------------------------------|
| 1. Total NV % Wt. | ASTM D2369 | 50.12 |
| 2. Wt. per Gallon | ASTM D1475 | 8.312 lbs/gal |
| 3. Viscosity Cps (Brookfield) | ASTM D2196 | 910 (3,50) |
| 4. % Water | ASTM D1364 | 0.40 |
| 5. Stability 77°F | ASTM D1849 | 1000 (3,50) |
| 6. Stability 120°F (no skins, sed) | ASTM D1849 | 1000 (3,50) |
| 7. Freeze - Thaw Res. (All H ₂ O Based Products) | ASTM D2243 | N/A |
| 8. Dry Time Q panel | ASTM D1640 | STT: 1 hr. 15 min. DH: 7 hrs. |
| 9. Hardness | ASTM D3363 | HB |
| 10. Block Res. | STD 141B FTM 6216 | 11 hrs. |
| 11. 60° Gloss | ASTM D523 | 79 Q panel |
| 12. Yellowness Index | STD 141B 6131 | N/A (grey) |
| 13. Humidity Res. | ASTM D2247 | See attached |
| 14. Adhesion | ASTM D3359 | 5 |
| 15. H ₂ O Cleanup (All H ₂ O Based Products) | --- | (Oil based) N/A |
| 16. Abrasion Res. | ASTM D4060 | 0.077 gms |
| 17. Flexibility | ASTM D1737 | 1/8" mandrel |
| 18. Impact Res. | ASTM D2794 | 84 inch lbs. |
| 19. Appearance | --- | Exc. very glossy |
| 20. Application Properties (Conv.) | --- | * Brushes exc. sprays good |
| 21. Sag Res. | ASTM D2801 | 5 mils |
| 22. Levelling | ASTM D2801 | 7 |
| 23. Contrast Ratio | ASTM D2805 | 1.0 |
| 24. Acc. Weathering (300 hrs) 60° specular gloss | ASTM G23, D822 | 49 |
| 25. Salt Spray Res. (140 hrs) | ASTM B117 | See attached |
| 26. VOC | | 497.11 |

* reduced with 5% by volume, 1,1,1 Trichlorethane prior to spraying

Note: Items 15, 19, 20 are qualitative tests.

Application properties: includes brush, roller, spray
 (airless, conventional) as applicable.

13. Humidity Resistance

| | Size | Frequency | Pattern | Extent of Corrosion |
|---------------|------|-----------|--------------------------------------|---------------------|
| 1. Blistering | 8 | Few | Random over field | -- |
| 2. Corrosion | -- | -- | Some random isolated field corrosion | -- |

25. Salt Spray Resistance

| | Size | Frequency | Pattern | Extent of Corrosion |
|---------------|------|-----------|--|---|
| 1. Blistering | 2 | Few | Random along both scribes | |
| | 8 | Few | Random over field | |
| 2. Corrosion | -- | -- | Uniform along scribes; random over field | 1/8" from both scribes some field corrosion |

LABORATORY REPORT FORM

Contract # A4 166 48

Sample No. RDA -II-25-1
 Contract #A5 097 48
 Date received: 3/13/86
 Log No.: 313 2A-2C
 Lab code: RC-9
 Quantity: 1 Pt., 2 Qts.
 Test initiated: 3/14/86
 Test completed: 12/86

Chemist: A. Khan
R. Haffner

Product Category: 9. Roof Coatings

| <u>Tests</u> | <u>Procedure</u> | <u>Results</u> |
|---|------------------|---|
| 1. Total NV % Wt. | ASTM D2369 | <u>60.34%</u> |
| 2. Wt. per Gallon | ASTM D1475 | <u>9.94</u> |
| 3. Viscosity Cps (Brookfield) | ASTM D2196 | <u>1.7×10^3 (5,20)</u> |
| 4. % Water | ASTM D1364 | <u>37.09</u> |
| 5. Stability 77°F | ASTM D1849 | <u>1.75×10^3 (5,20)</u> |
| 6. Stability 120°F | ASTM D1849 | <u>Material solidified</u> |
| 7. Freeze - Thaw Res. (All H ₂ O Based Products) | ASTM D2243 | <u>Solidified</u> |
| 8. Dry Time | ASTM D1640 | STT: 50 min. |
| 9. Ponding-H ₂ O Res. | --- | DH: 70 min. |
| 10. Humidity Res. (48 Hrs.) | ASTM D2247 | * <u>30.0</u> |
| 11. Adhesion | ASTM D3359 | ** <u>No blisters</u> |
| 12. H ₂ O Cleanup (All H ₂ O Based Products) | --- | <u>4</u> |
| 13. Flexibility 1/8" mandrel | ASTM D1737 | <u>Satisfactory</u> |
| 14. Impact Res.(60 in. lbs.) | ASTM D2794 | <u>Passed</u> |
| 15. Appearance | --- | <u>Passed</u> |
| 16. Application Properties | --- | <u>Smooth</u> |
| 17. Acc. Weathering | ASTM G23, D822 | <u>Satisfactory brushing</u> |
| 18. Elongation | ASTM D2370 | *** <u>see below</u> |
| 19. Tensile Strength | ASTM D2370 | <u>240%</u> |
| 20. VOC | | <u>360 psi</u> |
| | | <u>1. 30.63 2. 54.82</u> |

*gms/day.M²

**Some rust bleeding

***Slight yellowing, slight loss in 60° gloss, uniform #8 blisters over field

Note: Items 12, 15, 16 are qualitative tests.
 Item 9 run as described.

- a. Ponding water res: preformed urethane form dish filled with water wt % increase monitored per 24 hours.
- b. Application properties: includes brush, roller, spray (airless, conventional) as applicable.

LABORATORY REPORT FORM

Contract # A4 166 48

Sample No. RDA -II-25-2
 Contract #A5 097 48
 Date received: 3/14/86
 Log No.: 314 3A-3C
 Lab code: 009-09-00
 Quantity: 1 Pt./2 Qts.
 Test initiated: 3/18/86
 Test completed: 12/86

Chemist: A. Khan
R. Haffner

Product Category: 9. Roof Coatings

| <u>Tests</u> | <u>Procedure</u> | <u>Results</u> |
|---|------------------|---|
| 1. Total NV % Wt. | ASTM D2369 | <u>56.7%</u> |
| 2. Wt. per Gallon | ASTM D1475 | <u>8.78</u> |
| 3. Viscosity Cps (Brookfield) | ASTM D2196 | <u>2800 cp</u> |
| 4. % Water | ASTM D1364 | <u>37.79</u> |
| 5. Stability 77°F | ASTM D1849 | <u>2200 (4,20)</u> |
| 6. Stability 120°F | ASTM D1849 | <u>3400 cps (4,20)</u> |
| 7. Freeze - Thaw Res. (All H ₂ O Based Products) | ASTM D2243 | <u>Smooth Paste =2400 cps</u> |
| 8. Dry Time | ASTM D1640 | <u>STT: 1.5 hrs.</u> <u>DH: 4 hrs.</u> |
| 9. Ponding-H ₂ O Res. | --- | <u>* 29.10</u> |
| 10. Humidity Res. (48 Hrs.) | ASTM D2247 | <u>** see below</u> |
| 11. Adhesion | ASTM D3359 | <u>5</u> |
| 12. H ₂ O Cleanup (All H ₂ O Based Products) | --- | <u>Satisfactory</u> |
| 13. Flexibility | ASTM D1737 | <u>Passed</u> |
| 14. Impact Res. | ASTM D2794 | <u>Passed</u> |
| 15. Appearance | --- | <u>Smooth</u> |
| 16. Application Properties | --- | <u>Brushable</u> |
| 17. Acc. Weathering | ASTM G23, D822 | <u>*** see below</u> |
| 18. Elongation | ASTM D2370 | <u>1800</u> |
| 19. Tensile Strength | ASTM D2370 | <u>250</u> |
| 20. VOC | | <u>1. 58.00 2. 96.13</u> |

*gms/day.M²

**Slight blistering, no rust penetration

***Slight loss in 60° gloss; overall appearance good, some surface

Note: Items 12, 15, 16 are qualitative tests.
 Item 9 run as described.

a. Ponding water res: preformed urethane form dish filled
 with water wt % increase monitored per 24 hours.

b. Application properties: includes brush, roller, spray
 (airless, conventional) as applicable.

LABORATORY REPORT FORM

Contract # A4 166 48

Sample No. RDA -II-25-3
 Contract #A5 097 48
 Date received: 3/14/86
 Log No.: 314 5A-5C
 Lab code: 011-09-00
 Quantity: 1 Pt./2 Qts.
 Test initiated: 3/17/86
 Test completed: 12/86

Chemist: A. Khan
 R. Haffner

Product Category: 9. Roof Coatings

| Tests | Procedure | Results |
|---|----------------|----------------------------|
| 1. Total NV % Wt. | ASTM D2369 | 67.22% |
| 2. Wt. per Gallon | ASTM D1475 | 12.22 Lbs/Gal |
| 3. Viscosity Cps (Brookfield) | ASTM D2196 | 11,600 cp(4,5) |
| 4. % Water | ASTM D1364 | 31.76 |
| 5. Stability 77°F | ASTM D1849 | 5000 (5,20) |
| 6. Stability 120°F | ASTM D1849 | 5100 (5,20) |
| 7. Freeze - Thaw Res. (All H ₂ O Based Products) | ASTM D2243 | * Pass 5500 (5,20) |
| 8. Dry Time | ASTM D1640 | STT: 1.1 Hr. DH: 3 Hrs. |
| 9. Ponding-H ₂ O Res. | --- | ** 82.08 |
| 10. Humidity Res. | ASTM D2247 | Pass |
| 11. Adhesion | ASTM D3359 | 5 (felt) |
| 12. H ₂ O Cleanup (All H ₂ O Based Products) | --- | Satisfactory |
| 13. Flexibility | ASTM D1737 | Passed |
| 14. Impact Res. | ASTM D2794 | Passed |
| 15. Appearance | --- | Smooth finish |
| 16. Application Properties | --- | Good brushing |
| 17. Acc. Weathering | ASTM G23, D822 | *** see below |
| 18. Elongation | ASTM D2370 | 138% |
| 19. Tensile Strength | ASTM D2370 | 243 psi |
| 20. VOC | | 1. 14.94 2. 27.85 |

*Smooth paste
 **gms/day.M²
 ***some yellowing

Note: Items 12, 15, 16 are qualitative tests.
 Item 9 run as described.

- Ponding water res: preformed urethane form dish filled with water wt % increase monitored per 24 hours.
- Application properties: includes brush, roller, spray (airless, conventional) as applicable.

LABORATORY REPORT FORM

Contract # A4 166 48

Sample No. RDA -II-25-4
 Contract #A5 097 48
 Date received: 3/25/86
 Log No.: 325 5A-5C
 Lab code: 037-09-00
 Quantity: 1 Pt./2 Qts.
 Test initiated: 3/26/86
 Test completed: 12/86

Chemist: A. Khan
R. Haffner

Product Category: 9. Roof Coatings

| <u>Tests</u> | <u>Procedure</u> | <u>Results</u> |
|---|------------------|---|
| 1. Total NV % Wt. | ASTM D2369 | <u>76.5</u> |
| 2. Wt. per Gallon | ASTM D1475 | <u>8.4</u> |
| 3. Viscosity Cps (Brookfield) | ASTM D2196 | <u>7.3×10^4 (6,5)</u> |
| 4. % Water | ASTM D1364 | <u>0.52</u> |
| 5. Stability 77°F | ASTM D1849 | <u>5.9×10^4 (6,5)</u> |
| 6. Stability 120°F | ASTM D1849 | <u>5.4×10^4 (6,5)</u> |
| 7. Freeze - Thaw Res. (All H ₂ O Based Products) | ASTM D2243 | <u>N/A</u> |
| 8. Dry Time | ASTM D1640 | <u>STT: 18 hrs.</u> |
| 9. Ponding-H ₂ O Res. | --- | <u>DH: 2 days</u> |
| 10. Humidity Res. | ASTM D2247 | <u>* 6.24</u> |
| 11. Adhesion | ASTM D3359 | <u>Pass</u> |
| 12. H ₂ O Cleanup (All H ₂ O Based Products) | --- | <u>4</u> |
| 13. Flexibility | ASTM D1737 | <u>N/A (solvent based)</u> |
| 14. Impact Res. | ASTM D2794 | <u>Passed</u> |
| 15. Appearance | --- | <u>Passed 60 in. lbs.</u> |
| 16. Application Properties | --- | <u>** see below</u> |
| 17. Acc. Weathering | ASTM G23, D822 | <u>Spreadable, brushable</u> |
| 18. Elongation | ASTM D2370 | <u>*** see below</u> |
| 19. Tensile Strength | ASTM D2370 | <u>100%</u> |
| 20. VOC | | <u>26 psi</u> |
| | | <u>236.68</u> |

*gms/day.M²

**Glossy paste, slightly gritty

***Large loss in 60" gloss, large cracks, pits developing down to felt substrate (uniform over field)

Note: Material remained soft

Note: Items 12, 15, 16 are qualitative tests.
 Item 9 run as described.

- a. Ponding water res: preformed urethane form dish filled with water wt % increase monitored per 24 hours.
- b. Application properties: includes brush, roller, spray (airless, conventional) as applicable.

LABORATORY REPORT FORM

Contract # A4 166 48

Sample No. RDA -II-25-5
Contract #A5 097 48
Date received: 3/21/86
Log No.: 321 3A-3C
Lab code: 034-09-00
Quantity: 1 Pt./2 Qts.
Test initiated: 3/25/86
Test completed: 12/86

Chemist: A. Khan
R. Haffner

Product Category: 9. Roof Coatings

| <u>Tests</u> | <u>Procedure</u> | <u>Results</u> |
|---|------------------|---|
| 1. Total NV % Wt. | ASTM D2369 | 73.24 |
| 2. Wt. per Gallon | ASTM D1475 | 7.91 |
| 3. Viscosity Cps (Brookfield) | ASTM D2196 | 7600 (5,20) |
| 4. % Water | ASTM D1364 | 1.03 |
| 5. Stability 77°F | ASTM D1849 | 8900 (5,20) |
| 6. Stability 120°F | ASTM D1849 | 7400 (5,20) |
| 7. Freeze - Thaw Res. (All H ₂ O Based Products) | ASTM D2243 | N/A |
| 8. Dry Time | ASTM D1640 | STT: 18 hrs. DH: 4 days (slight soft) |
| 9. Ponding-H ₂ O Res. | --- | * 39.12 |
| 10. Humidity Res. | ASTM D2247 | Pass |
| 11. Adhesion | ASTM D3359 | 4 |
| 12. H ₂ O Cleanup (All H ₂ O Based Products) | --- | N/A (solvent based) |
| 13. Flexibility | ASTM D1737 | Passed 1/8" mandrel |
| 14. Impact Res. | ASTM D2794 | Passed 60 in. lbs. |
| 15. Appearance | --- | Glossy-smooth |
| 16. Application Properties | --- | Spreadable, brushable |
| 17. Acc. Weathering | ASTM G23, D822 | ** see below |
| 18. Elongation | ASTM D2370 | 324 |
| 19. Tensile Strength | ASTM D2370 | 8.5 psi |
| 20. VOC | | 244.03 |

*gms/day.M²

**Large loss in 60° gloss, cracks, pits developing down to substrate (uniform over field)

Note: Items 12, 15, 16 are qualitative tests.
Item 9 run as described.

- Ponding water res: preformed urethane form dish filled with water wt % increase monitored per 24 hours.
- Application properties: includes brush, roller, spray (airless, conventional) as applicable.

LABORATORY REPORT FORM

Contract # A4 166 48

Sample No. RDA -II-25-6
 Contract #A5 097 48
 Date received: 3/24/86
 Log No.: 324 2A-2C
 Lab code: 031-09-00
 Quantity: 1 Pt./2 Qts.
 Test initiated: 3/25/86
 Test completed: 12/86

Chemist: A. Khan
R. Haffner

Product Category: 9. Roof Coatings

| Tests | Procedure | Results |
|---|----------------|------------------------------|
| 1. Total NV % Wt. | ASTM D2369 | 69.3 |
| 2. Wt. per Gallon | ASTM D1475 | 7.95 |
| 3. Viscosity Cps (Brookfield) | ASTM D2196 | 3680 (5,50) |
| 4. % Water | ASTM D1364 | 0.06 |
| 5. Stability 77°F | ASTM D1849 | 3680 (5,50) |
| 6. Stability 120°F | ASTM D1849 | 3700 (5,50) |
| 7. Freeze - Thaw Res. (All H ₂ O Based Products) | ASTM D2243 | N/A |
| 8. Dry Time | ASTM D1640 | STT: 24 hrs. DH: 3 days |
| 9. Ponding-H ₂ O Res. | --- | * 31.2 |
| 10. Humidity Res. | ASTM D2247 | Slight blistering No rust |
| 11. Adhesion | ASTM D3359 | 4 |
| 12. H ₂ O Cleanup (All H ₂ O Based Products) | --- | N/A (solvent based) |
| 13. Flexibility | ASTM D1737 | Passed 1/8" mandrel |
| 14. Impact Res. | ASTM D2794 | Passed 60 in.-Lb. |
| 15. Appearance | --- | Smooth glossy, slight grit |
| 16. Application Properties | --- | **Spreadable |
| 17. Acc. Weathering | ASTM G23, D822 | *** see below |
| 18. Elongation | ASTM D2370 | 290% |
| 19. Tensile Strength | ASTM D2370 | 7.6 psi |
| 20. VOC | | 292.63 |

*gms/day.M²

**Roller, brush, spatula

***Large loss in 60° gloss, large cracks, pits developing down to substrate (uniform over field)

Note: Items 12, 15, 16 are qualitative tests.
 Item 9 run as described.

- a. Ponding water res: preformed urethane form dish filled with water wt % increase monitored per 24 hours.
- b. Application properties: includes brush, roller, spray (airless, conventional) as applicable.

LABORATORY REPORT FORM

Contract # A4 166 48

Sample No. RDA -II-26-1
 Contract No. A5 097 48
 Date received: 3/24/86
 Log No.: 324 3A-3C
 Lab code: 032-10-00
 Quantity: 1 Pt./2 Qts.
 Test initiated: 3/25/86
 Test completed: 12/86

Chemist: A. Khan
L. Kudela

Product Category: 10. Specialty Primers

| <u>Tests</u> | <u>Procedure</u> | <u>Results</u> |
|---------------------------------------|---------------------|---|
| 1. Total NV % Wt. | ASTM D2369 | <u>37.4</u> |
| 2. Wt. per Gallon | ASTM D1475 | <u>10.13</u> |
| 3. Viscosity Cps (Brookfield) | ASTM D2196 | <u>710 (3,50)</u> |
| 4. % Water | ASTM D1364 | <u>58.76</u> |
| 5. Stability 77°F | ASTM D1849 | <u>880 cp (#3,50)</u> |
| 6. Stability 120°F | ASTM D1849 | <u>796 cp (#3,50)</u> |
| 7. Freeze - Thaw Res. | ASTM D2243 | <u>Increase in viscosity</u> <u>(\uparrow = 8600 cps)</u> |
| (All H ₂ O Based Products) | | |
| 8. Dry Time | ASTM D1640 | <u>STT: 1hr. 30 min.</u> |
| 9. Hardness | ASTM D3363 | <u>DH: 2 hrs.</u> |
| 10. Sanding Prop. | STD 141B FTM 6321 | <u>< HB</u> |
| 11. Humidity Res. | ASTM D2247 | <u>Sandable</u> |
| 12. Adhesion (concrete) | ASTM D3359 | <u>*See below</u> |
| 13. En. Holdout (self sealing) | --- | <u>4</u> |
| 14. H ₂ O Cleanup | --- | <u>0.987</u> |
| (All H ₂ O Based Products) | | |
| 15. Flexibility | ASTM D1737 | <u>Washable when wet</u> |
| 16. Appearance | --- | <u>Failed</u> |
| 17. Application Properties | --- | <u>Smooth, flat</u> |
| 18. Sag Res. | ASTM D2801 | <u>Brush, spray satisf.</u> |
| 19. Levelling | ASTM D2801 | <u>5 mils</u> |
| 20. Salt Spray Res. | ASTM B117 | <u>2</u> |
| 21. Bleed Res. | --- | <u>Rust through upon app.</u> |
| 22. Alkali Res. | STD 141B FTM TTC555 | <u>Good</u> |
| 23. VOC | | <u>Dissolves</u> <u>1. 46.64 2. 161.32</u> |

*No blisters, no surface changes

Note: Rusts thru upon drying

Note: Items 14, 16, 17 are qualitative tests. Item 13 run as described.

a. Enamel Holdout: ratio of 60° gloss of TT489 enamel over paint vs sealed Morest chart.

b. Application properties: includes brush, roller, spray (airless, conventional) as applicable.

LABORATORY REPORT FORM

Contract # A4 166 48

Sample No. RDA -II-26-2

Contract No. A5 097 48

Date received: 4/2/86

Log No.: 42 3A-3C

Lab code: 045-10

Quantity: 1 Pt./2 Qts.

Test initiated: 4/3/86

Test completed: 12/86

Chemist: A. Khan

L. Kudela

Product Category: 10. Specialty Primers- Concrete

| Tests | Procedure | Results |
|---|----------------|-----------------------------|
| 1. Total NV % Wt. | ASTM D2369 | 20.9 |
| 2. Wt. per Gallon | ASTM D1475 | 8.45 |
| 3. Viscosity Cps (Brookfield) | ASTM D2196 | 17 (1,100) |
| 4. % Water | ASTM D1364 | 75.4 |
| 5. Stability 77°F | ASTM D1849 | 20.0 cp (#1,100) |
| 6. Stability 120°F | ASTM D1849 | 17.4 cp (#1,100) |
| 7. Freeze - Thaw Res. (All H ₂ O Based Products) | ASTM D2243 | 20 cp (#1,100) |
| 8. Dry Time | ASTM D1640 | STT: 25 min. DH: 35 min. |
| 9. Hardness | ASTM D3363 | < HB |
| 10. Sanding Prop. STD 141B FTM 6321 | | Not sandable |
| 11. Humidity Res. | ASTM D2247 | *See below |
| 12. Adhesion (concrete) | ASTM D3359 | 5 |
| 13. En. Holdout (self sealing) | --- | Crawling on Morest chart |
| 14. H ₂ O Cleanup (All H ₂ O Based Products) | --- | Washable when wet |
| 15. Flexibility | ASTM D1737 | Passes 1/8" mandrel |
| 16. Appearance | --- | ** see below |
| 17. Application Properties | --- | ***Brush and spray good |
| 18. Sag Res. | ASTM D2801 | 0 |
| 19. Levelling | ASTM D2801 | >10 |
| 20. Salt Spray Res. | ASTM B117 **** | See below |
| 21. Bleed Res. | --- | Good |
| 22. Alkali Res. STD 141B FTM TTC555 | | Passed |
| 23. VOC | | 1. 37.49 2. 157.19 |

*No blisters, no surface changes

**Smooth, transparant when dried on concrete

***Extremely foamy, drips-very low viscosity

****Note: 1/4 to 1/2 inch corrosion along scribes, isolated field corrosion= 50%

Note: Items 14, 16, 17 are qualitative tests. Item 13 run as described.

a. Enamel Holdout: ratio of 60° gloss of TT489 enamel over paint vs sealed Morest chart.

b. Application properties: includes brush, roller, spray (airless, conventional) as applicable.

LABORATORY REPORT FORM

Contract # A4 166 48

Sample No. RDA -II-26-3
 Contract No. A5 097 48
 Date received: 4/2/86
 Log No.: 42 4A-4C
 Lab code: 046-10
 Quantity: 1 Pt./2 Qts.
 Test initiated: 4/3/86
 Test completed: 12/86

Chemist: A. Khan
L. Kudela

Product Category: 10. Specialty Primers- Concrete

| Tests | Procedure | Results |
|---|---------------------|--------------------------------|
| 1. Total NV % Wt. | ASTM D2369 | <u>21.6</u> |
| 2. Wt. per Gallon | ASTM D1475 | <u>8.47</u> |
| 3. Viscosity Cps (Brookfield) | ASTM D2196 | <u>20.5 (1,100)</u> |
| 4. % Water | ASTM D1364 | <u>74.9</u> |
| 5. Stability 77°F | ASTM D1849 | <u>19.5 cp (#1,100)</u> |
| 6. Stability 120°F | ASTM D1849 | <u>19.3 cp (#1,100)</u> |
| 7. Freeze - Thaw Res. (All H ₂ O Based Products) | ASTM D2243 | <u>No change 20 cp (1,100)</u> |
| 8. Dry Time | ASTM D1640 | <u>STT: 35 min.</u> |
| 9. Hardness | ASTM D3363 | <u>DH: 45 min.</u> |
| 10. Sanding Prop. | STD 141B FTM 6321 | <u>HB</u> |
| 11. Humidity Res. | ASTM D2247 | <u>Not sandable</u> |
| 12. Adhesion (concrete) | ASTM D3359 | <u>No blisters</u> |
| 13. En. Holdout (self sealing) | --- | <u>5</u> |
| 14. H ₂ O Cleanup (All H ₂ O Based Products) | --- | <u>Crawling on Most Chart</u> |
| 15. Flexibility | ASTM D1737 | <u>Washable when wet</u> |
| 16. Appearance | --- | <u>Passes 1/8" mandrel</u> |
| 17. Application Properties | --- | <u>* see below</u> |
| 18. Sag Res. | ASTM D2801 | <u>Spray, brush satisf.</u> |
| 19. Levelling | ASTM D2801 | <u>0</u> |
| 20. Salt Spray Res. | ASTM B117 | <u>10</u> |
| 21. Bleed Res. | --- | <u>**See below</u> |
| 22. Alkali Res. | STD 141B FTM TTC555 | <u>Good</u> |
| 23. VOC | | <u>Passed</u> |
| | | <u>1. 35.55 2. 145.93</u> |

*Smooth, transparent when dried on concrete

**Note: 1/8 to 1/2 inch rusts from scribes;= 1% isolated spot corrosion. Rusts stains 70% on substrate. Slight wrinkling of films.

Note: Items 14, 16, 17 are qualitative tests. Item 13 run as described.

a. Enamel Holdout: ratio of 60° gloss of TT489 enamel over paint vs sealed Mostest chart.

b. Application properties: includes brush, roller, spray (airless, conventional) as applicable.

LABORATORY REPORT FORM

Contract # A4 166 48

Sample No. RDA -II-26-4
 Contract No. A5 097 48
 Date received: 4/16/86
 Log No.: 416 5A-5C
 Lab code: 053-10
 Quantity: 1 Pt./2 Qts.
 Test initiated: 4/22/86
 Test completed: 12/86

Chemist: A. Khan
L. Kudela

Product Category: 10. Specialty Primers

| <u>Tests</u> | <u>Procedure</u> | <u>Results</u> |
|---|------------------|--------------------------------|
| 1. Total NV % Wt. | ASTM D2369 | <u>47.9</u> |
| 2. Wt. per Gallon | ASTM D1475 | <u>10.7</u> |
| 3. Viscosity Cps (Brookfield) | ASTM D2196 | <u>5300 (5,20)</u> |
| 4. % Water | ASTM D1364 | <u>45.90%</u> |
| 5. Stability 77°F | ASTM D1849 | <u>4900 cp (#5,20)</u> |
| 6. Stability 120°F | ASTM D1849 | <u>3100 cp (#5,20)</u> |
| 7. Freeze - Thaw Res. (All H ₂ O Based Products) | ASTM D2243 | <u>4200 cp (#5,20)</u> |
| 8. Dry Time | ASTM D1640 | <u>STT: 18 min.</u> |
| 9. Hardness | ASTM D3363 | <u>DH: 28 min.</u> |
| 10. Sanding Prop. STD 141B FTM 6321 | | <u>HB</u> |
| 11. Humidity Res. | ASTM D2247 | <u>Poor</u> |
| 12. Adhesion (concrete) | ASTM D3359 | <u>*See below</u> |
| 13. En. Holdout (self sealing) | --- | <u>5</u> |
| 14. H ₂ O Cleanup (All H ₂ O Based Products) | --- | <u>1.00</u> |
| 15. Flexibility | ASTM D1737 | <u>Satisfactory</u> |
| 16. Appearance | --- | <u>Passed 1/8 in mandrel</u> |
| 17. Application Properties | --- | <u>Smooth</u> |
| 18. Sag Res. | ASTM D2801 | <u>Sprayable upon red.-15%</u> |
| 19. Levelling | ASTM D2801 | <u>11</u> |
| 20. Salt Spray Res. | ASTM B117 | <u>1-2</u> |
| 21. Bleed Res. | --- | <u>** see below</u> |
| 22. Alkali Res. STD 141B FTM TTC555 | | <u>Poor</u> |
| 23. VOC | | <u>Film weakens, detaches</u> |
| | | <u>from substrates</u> |
| | | <u>1. 79.54 2. 192.82</u> |

*Blisters no. 4 medium in the field; few pinholes

** Small to medium size blisters on either side of scribe. Few clusters of small field blisters. Corrosion along and extends 1/16 to 1/8" from scribes. Few corrosions at burst blisters.

Note: Items 14, 16, 17 are qualitative tests. Item 13 run as described.

a. Enamel Holdout: ratio of 60° gloss of TT489 enamel over paint vs sealed Morest chart.

b. Application properties: includes brush, roller, spray (airless, conventional) as applicable.

LABORATORY REPORT FORM

Contract # A4 166 48

Sample No. RDA -II-26-5
Contract No. A5 097 48
Date received: 4/23/86
Log No.: 423 3A-3C
Lab code: 056-10
Quantity: 1 Pt./2 Qts.
Test initiated: 4/25/86
Test completed: 12/86

Chemist: A. Khan
L. Kudela

Product Category: 10. Specialty Primers

| Tests | Procedure | Results |
|---|---------------------|----------------------|
| 1. Total NV % Wt. | ASTM D2369 | 70.7 |
| 2. Wt. per Gallon | ASTM D1475 | 11.08 |
| 3. Viscosity Cps (Brookfield) | ASTM D2196 | 2050 (3,20) |
| 4. % Water | ASTM D1364 | 0.86 |
| 5. Stability 77°F | ASTM D1849 | 1630 cp (#3,20) |
| 6. Stability 120°F | ASTM D1849 | 1750 cps (3,20) |
| 7. Freeze - Thaw Res. (All H ₂ O Based Products) | ASTM D2243 | N/A |
| 8. Dry Time | ASTM D1640 | STT: 2hrs. 50 min. |
| 9. Hardness | ASTM D3363 | DH: 5hrs. 45 min. |
| 10. Sanding Prop. | STD 141B FTM 6321 | HB (flaky) |
| 11. Humidity Res. | ASTM D2247 | Sandable |
| 12. Adhesion (wood) | ASTM D3359 | * See below |
| 13. En. Holdout (self sealing) | --- | 4 |
| 14. H ₂ O Cleanup (All H ₂ O Based Products) | --- | 0.987 |
| 15. Flexibility | ASTM D1737 | N/A |
| 16. Appearance | --- | Passed 1/8 mandrel |
| 17. Application Properties | --- | Smooth |
| 18. Sag Res. | ASTM D2801 | Good brush and spray |
| 19. Levelling | ASTM D2801 | 6 |
| 20. Salt Spray Res. | ASTM B117 | 5-6 |
| 21. Bleed Res. | --- | ** See below |
| 22. Alkali Res. | STD 141B FTM TTC555 | Fair |
| 23. VOC | | Dissolves |
| | | 389.24 |

Note: Items 14, 16, 17 are qualitative tests. Item 13 run as described.

a. Enamel Holdout: ratio of 60° gloss of TT489 enamel over paint vs sealed Morest chart.

b. Application properties: includes brush, roller, spray (airless, conventional) as applicable.

*No blistering, stain bleeding

**No blisters. Corrosion along scribes only, and occasionally extends to 1/16" on either side of scribe. Rust stain field paint.

LABORATORY REPORT FORM

Contract # A4 166 48

Sample No. RDA -II-26-6
 Contract No. A5 097 48
 Date received: 4/23/86
 Log No.: 423 4A-4C
 Lab code: 057-10
 Quantity: 1 Pt./2 Qts.
 Test initiated: 4/25/86
 Test completed: 12/86

Chemist: A. Khan
L. Kudela

Product Category: 10. Specialty Primers

| Tests | Procedure | Results |
|---|---------------------|---------------------------------|
| 1. Total NV % Wt. | ASTM D2369 | <u>51.4</u> |
| 2. Wt. per Gallon | ASTM D1475 | <u>11.42</u> |
| 3. Viscosity Cps (Brookfield) | ASTM D2196 | <u>4225 (3,20)</u> |
| 4. % Water | ASTM D1364 | <u>49.76</u> |
| 5. Stability 77°F | ASTM D1849 | <u>4370 cp (#3,20)</u> |
| 6. Stability 120°F | ASTM D1849 | <u>4050 cp (#3,20)</u> |
| 7. Freeze - Thaw Res. (All H ₂ O Based Products) | ASTM D2243 | <u>3950 cp (#3,20)</u> |
| 8. Dry Time | ASTM D1640 | <u>STT: 32 mins.</u> |
| 9. Hardness | ASTM D3363 | <u>DH: 43 mins.</u> |
| 10. Sanding Prop. | STD 141B FTM 6321 | <u><HB</u> |
| 11. Humidity Res. | ASTM D2247 | <u>Sandable</u> |
| 12. Adhesion (wood) | ASTM D3359 | <u>*See below</u> |
| 13. En. Holdout (self sealing) | --- | <u>4</u> |
| 14. H ₂ O Cleanup (All H ₂ O Based Products) | --- | <u>1.00</u> |
| 15. Flexibility | ASTM D1737 | <u>Satisfactory</u> |
| 16. Appearance | --- | <u>Passes 1/8" mandrel</u> |
| 17. Application Properties | --- | <u>Smooth (flat)</u> |
| 18. Sag Res. | ASTM D2801 | <u>**Sprayable upon red.20%</u> |
| 19. Levelling | ASTM D2801 | <u>>12</u> |
| 20. Salt Spray Res. | ASTM B117 | <u>0</u> |
| 21. Bleed Res. | --- | <u>*** See note</u> |
| 22. Alkali Res. | STD 141B FTM TTC555 | <u>Poor</u> |
| 23. VOC | | <u>Detaches from</u> |
| | | <u>substrate</u> |
| | | <u>1. 0 2. 3.09</u> |

*Blistering and stain bleeding

**Strong ammonia odor

***Small to medium size blisters along either side of scribes and a few in field. Corrosion along either side of end extends 1/8 to 1/2" from scribes. Occasional field corrosion at bust blisters.

Note: Items 14, 16, 17 are qualitative tests. Item 13 run as described.

a. Enamel Holdout: ratio of 60° gloss of TT489 enamel over paint vs sealed Morest chart.

b. Application properties: includes brush, roller, spray (airless, conventional) as applicable.

LABORATORY REPORT FORM

Contract # A4 166 48

Sample No. RDA -II-27-2
 Contract No. A5 097 48
 Date received: 3/17/86
 Log No.: 317 2A-2C
 Lab code: SS2
 Quantity: 1 Pt./2 Qts.
 Test initiated: 3/21/86
 Test completed: 12/86

Chemist: L. Kudela

Product Category: 11. Specialty Sealers

| <u>Tests</u> | <u>Procedure</u> | <u>Results</u> |
|---|---------------------|--------------------------------|
| 1. Total NV % Wt. | ASTM D2369 | <u>50.98</u> |
| 2. Wt. per Gallon | ASTM D1475 | <u>10.66</u> |
| 3. Viscosity Cps (Brookfield) | ASTM D2196 | <u>9846 cp #5 (20,50)</u> |
| 4. % Water | ASTM D1364 | <u>37.53</u> |
| 5. Stability 77°F | ASTM D1849 | <u>11772 cp #5 (20,50)</u> |
| 6. Stability 120°F | ASTM D1849 | <u>9400 cp #5 (20,50)</u> |
| 7. Freeze - Thaw Res. (All H ₂ O Based Products) | ASTM D2243 | <u>9440 cp #5 (20,50)</u> |
| 8. Dry Time | ASTM D1640 | STT:2min/DH:21min concrete |
| 9. Humidity Res. | ASTM D2247 | STT:21min/DH:36min metal |
| 10. Adhesion | ASTM D3359 | <u>No blisters, no corros.</u> |
| 11. En. Holdout (self sealing) | --- | <u>5</u> |
| 12. H ₂ O Cleanup (All H ₂ O Based Products) | --- | <u>0.91</u> |
| 13. Flexibility | ASTM D1737 | <u>Excellent</u> |
| 14. Appearance | --- | <u>1/8" Pass</u> |
| 15. Application Properties | --- | <u>Smooth</u> |
| 16. Sag Res. | ASTM D2801 | <u>Spray, brush, roller</u> |
| 17. Levelling | ASTM D2801 | <u>very good</u> |
| 18. Bleed Res. | --- | <u>12 mils</u> |
| 19. Alkali Res. | STD 141B FTM TTC555 | <u>-0-</u> |
| 20. VOC | | <u>Fair</u> |
| | | <u>Pass 48 hrs.</u> |
| | | <u>1. 146.86 2. 280.58</u> |

Note: Items 12, 14, 15 are qualitative tests. Item 11 run as described.

a. Enamel Holdout: ratio of 60° gloss of TT489 enamel over paint vs sealed Morest chart.

b. Application properties: includes brush, roller, spray (airless, conventional) as applicable.

LABORATORY REPORT FORM

Contract # A4 166 48

Sample No. RDA -II-27-3
 Contract No. A5 097 48
 Date received: 3/19/86
 Log No.: 319 1A-1C
 Lab code: SS3
 Quantity: 1 Pt./2 Qts.
 Test initiated: 3/21/86
 Test completed: 12/86

Chemist: L. Kudela

Product Category: 11. Specialty Sealers- Concrete

| Tests | Procedure | Results |
|---|------------|---------------------------|
| 1. Total NV % Wt. | ASTM D2369 | 12.52% |
| 2. Wt. per Gallon | ASTM D1475 | 9.11 lbs/gal |
| 3. Viscosity Cps (Brookfield) | ASTM D2196 | 12.7 cp #1 (50,100) |
| 4. % Water | ASTM D1364 | 75.95 |
| 5. Stability 77°F | ASTM D1849 | 18.2 cp #1 (50,100) |
| 6. Stability 120°F | ASTM D1849 | 24.0 cp #1 (50,100) |
| 7. Freeze - Thaw Res. (All H ₂ O Based Products) | ASTM D2243 | 13.6 cp #1 (50,100) |
| 8. Dry Time | ASTM D1640 | STT:2min/DH:53min conc. |
| 9. Humidity Res. | ASTM D2247 | STT:16 min/DH:70min metal |
| 10. Adhesion | ASTM D3359 | Failed |
| 11. En. Holdout (self sealing) | --- | 5 |
| 12. H ₂ O Cleanup (All H ₂ O Based Products) | --- | 0.89 |
| 13. Flexibility | ASTM D1737 | Good-easy |
| 14. Appearance | --- | Pass 1/8" |
| 15. Application Properties | --- | Smooth |
| 16. Sag Res. | ASTM D2801 | *Spray,brush-good |
| 17. Levelling | ASTM D2801 | 0 |
| 18. Bleed Res. | --- | N/A |
| 19. Alkali Res. STD 141B FTM TTC555 | | Good |
| 20. VOC | | Failed (48hrs) |
| | | 1. 125.94 2. 731.35 |

*Extremely low viscosity

Note: Items 12, 14, 15 are qualitative tests. Item 11 run as described.

- Enamel Holdout: ratio of 60° gloss of TT489 enamel over paint vs sealed Moresst chart.
- Application properties: includes brush, roller, spray (airless, conventional) as applicable.

LABORATORY REPORT FORM

Contract # A4 166 48

Sample No. RDA -II-27-4
 Contract No. A5 097 48
 Date received: 3/24/86
 Log No.: 324 4A-4C
 Lab code: SS4
 Quantity: 1 Pt./2 Qts.
 Test initiated: 3/25/86
 Test completed: 12/86

Chemist: L. Kudela

Product Category: 11. Specialty Sealers- Wood

| <u>Tests</u> | <u>Procedure</u> | <u>Results</u> |
|---|---------------------|--------------------------|
| 1. Total NV & Wt. | ASTM D2369 | 19.52 |
| 2. Wt. Per Gallon | ASTM D1475 | 6.76 lbs/gal |
| 3. Viscosity Cps (Brookfield) | ASTM D2196 | 16.2 cp #1 (50,100) |
| 4. % Water | ASTM D1364 | <0.1% |
| 5. Stability 77°F | ASTM D1849 | 19.5 cp #1 (50,100) |
| 6. Stability 120°F | ASTM D1849 | 16.1 cp #1 (50,100) |
| 7. Freeze - Thaw Res. (All H ₂ O Based Products) | ASTM D2243 | Oil Based |
| 8. Dry Time | ASTM D1640 | STT:2min/DH:42min conc. |
| 9. Humidity Res. | ASTM D2247 | STT:28min/DH:36min metal |
| 10. Adhesion | ASTM D3359 | No blister, no corros. |
| 11. En. Holdout (self sealing) | --- | 5 (wood) |
| 12. H ₂ O Cleanup (All H ₂ O Based Products) | --- | 0.805 |
| 13. Flexibility | ASTM D1737 | Good |
| 14. Appearance | --- | Pass 1/8" |
| 15. Application Properties | --- | Smooth |
| 16. Sag Res. | ASTM D2801 | Brush, spray-satisf. |
| 17. Levelling | ASTM D2801 | 0 |
| 18. Bleed Res. | --- | 10 |
| 19. Alkali Res. | STD 141B FTM TTC555 | Good |
| 20. VOC | | Failed (48 hrs) |
| | | 652.30 |

Note: Items 12, 14, 15 are qualitative tests. Item 11 run as described.

- a. Enamel Holdout: ratio of 60° gloss of TT489 enamel over paint vs sealed Morest chart.
- b. Application properties: includes brush, roller, spray (airless, conventional) as applicable.

LABORATORY REPORT FORM

Contract # A4 166 48

Sample No. RDA -II-27-5A,5B

Contract No. A5 097 48

Date received: 3/28/86

Log No.: 328 7A-7C,8A-8C

Lab code: SS5

Quantity: 1 Pt./2 Qts.

Test initiated: 4/3/86

Test completed: 12/86

Chemist: L. Kudela

Product Category: 11. Specialty Sealers

| <u>Tests</u> | <u>Procedure</u> | <u>Results</u> |
|---|------------------|--|
| 1. Total NV % Wt. | ASTM D2369 | <u>80.84%</u> |
| 2. Wt. per Gallon | ASTM D1475 | <u>12.33</u> |
| 3. Viscosity Cps (Brookfield) | ASTM D2196 | <u>3135 cp #4 (20,50)</u> <u>10 after prep.</u> |
| 4. % Water | ASTM D1364 | <u><0.1%</u> |
| 5. Stability 77°F | ASTM D1849 | <u>3660 cp #4 (20,50)</u> |
| 6. Stability 120°F | ASTM D1849 | <u>4735 cp #4 (20,50)</u> |
| 7. Freeze - Thaw Res. (All H ₂ O Based Products) | ASTM D2243 | <u>Oil based</u> |
| 8. Dry Time | ASTM D1640 | <u>STT: 3.2 hrs</u> |
| 9. Humidity Res. | ASTM D2247 | <u>DH: 10.5 hrs</u> |
| 10. Adhesion | ASTM D3359 | <u>No blisters, no corros.</u> |
| 11. En. Holdout (self sealing) | --- | <u>5</u> |
| 12. H ₂ O Cleanup (All H ₂ O Based Products) | --- | <u>1.00</u> |
| 13. Flexibility | ASTM D1737 | <u>N/A</u> |
| 14. Appearance | --- | <u>Pass 1/8"</u> |
| 15. Application Properties | --- | <u>Smooth</u> |
| 16. Sag Res. | ASTM D2801 | <u>* Brush, spray good</u> |
| 17. Levelling | ASTM D2801 | <u>3</u> |
| 18. Bleed Res. | | <u>#2</u> |
| 19. Alkali Res. STD 141B FTM TTC555 | | <u>Excellent</u> |
| 20. VOC | | <u>Pass (48 hrs)</u> |
| 21. Pot Life | | <u>283.25</u> |
| | | <u>8 hrs.</u> |

* Dilution 15% TCE

Note: Items 12, 14, 15 are qualitative tests. Item 11 run as described.

a. Enamel Holdout: ratio of 60° gloss of TT489 enamel over paint vs sealed Morest chart.

b. Application properties: includes brush, roller, spray (airless, conventional) as applicable.

LABORATORY REPORT FORM

Contract # A4 166 48

Sample No. RDA -II-27-6
 Contract No. A5 097 48
 Date received: 4/2/86
 Log No.: 42 5A-5C
 Lab code: SS6
 Quantity: 1 Pt./2 Qts.
 Test initiated: 4/4/86
 Test completed: 12/86

Chemist: L. Kudela

Product Category: 11. Specialty Sealers- Asphalt

| <u>Tests</u> | <u>Procedure</u> | <u>Results</u> |
|---|------------------|------------------------------|
| 1. Total NV % Wt. | ASTM D2369 | <u>49.72%</u> |
| 2. Wt. per Gallon | ASTM D1475 | <u>9.06 lbs/gal</u> |
| 3. Viscosity Cps (Brookfield) | ASTM D2196 | <u>128.8 cp #2 (50,100)</u> |
| 4. % Water | ASTM D1364 | <u>50.03</u> |
| 5. Stability 77°F | ASTM D1849 | <u>153.3 cp #2 (50,100)</u> |
| 6. Stability 120°F | ASTM D1849 | <u>137.5 cp #2 (50,100)</u> |
| 7. Freeze - Thaw Res. (All H ₂ O Based Products) | ASTM D2243 | <u>366 cp #2 (50,100)</u> |
| 8. Dry Time | ASTM D1640 | <u>STT: 42 min.</u> |
| 9. Humidity Res. | ASTM D2247 | <u>DH: 90 min.</u> |
| 10. Adhesion | ASTM D3359 | <u>No blisters (asphalt)</u> |
| 11. En. Holdout (self sealing) | --- | <u>5</u> |
| 12. H ₂ O Cleanup (All H ₂ O Based Products) | --- | <u>0.83</u> |
| 13. Flexibility | ASTM D1737 | <u>Easy</u> |
| 14. Appearance | --- | <u>Pass 1/8"</u> |
| 15. Application Properties | --- | <u>Smooth, white turns</u> |
| 16. Sag Res. | ASTM D2801 | <u>in clear</u> |
| 17. Levelling | ASTM D2801 | <u>Brush, spray-good</u> |
| 18. Bleed Res. | --- | <u>0</u> |
| 19. Alkali Res. STD 141B FTM TTC555 | --- | <u>N/A</u> |
| 20. VOC | --- | <u>Fair</u> |
| | | <u>Failed (48 hrs)</u> |
| | | <u>1. 2.91 2. 6.33</u> |

Note: Items 12, 14, 15 are qualitative tests. Item 11 run as described.

- a. Enamel Holdout: ratio of 60° gloss of TT489 enamel over paint vs sealed Morest chart.
- b. Application properties: includes brush, roller, spray (airless, conventional) as applicable.

LABORATORY REPORT FORM

Contract # A4 166 48

Sample No. RDA -II-27-7
 Contract No. A5 097 48
 Date received: 4/11/86
 Log No.: 411 4A-4C
 Lab code: SS7
 Quantity: 1 Pt./2 Qts.
 Test initiated: 4/14/86
 Test completed: 12/86

Chemist: L. Kudela

Product Category: 11. Specialty Sealers- Wood

| Tests | Procedure | Results |
|---|---------------------|------------------------------|
| 1. Total NV % Wt. | ASTM D2369 | 9.41% |
| 2. Wt. per Gallon | ASTM D1475 | 6.68 |
| 3. Viscosity Cps (Brookfield) | ASTM D2196 | 11.0 cp, #1 (50,100) |
| 4. % Water | ASTM D1364 | <0.1% |
| 5. Stability 77°F | ASTM D1849 | 12.1 cp #1 (50,100) |
| 6. Stability 120°F | ASTM D1849 | 14.5 cp #1 (50,100) |
| 7. Freeze - Thaw Res. (All H ₂ O Based Products) | ASTM D2243 | Solvent based |
| 8. Dry Time | ASTM D1640 | STT: 82 min. DH: →48 hrs. |
| 9. Humidity Res. | ASTM D2247 | No blisters, no field cor. |
| 10. Adhesion | ASTM D3359 | 3 |
| 11. En. Holdout (self sealing) | --- | 1.0 |
| 12. H ₂ O Cleanup (All H ₂ O Based Products) | --- | Good |
| 13. Flexibility | ASTM D1737 | Pass 1/8" |
| 14. Appearance | --- | Smooth |
| 15. Application Properties | --- | Brush, spray-good |
| 16. Sag Res. | ASTM D2801 | 0 |
| 17. Levelling | ASTM D2801 | N/A |
| 18. Bleed Res. | --- | Fair |
| 19. Alkali Res. | STD 141B FTM TTC555 | Failed (48 hrs) |
| 20. VOC | | 725.56 |

Note: Items 12, 14, 15 are qualitative tests. Item 11 run as described.

a. Enamel Holdout: ratio of 60° gloss of TT489 enamel over paint vs sealed Moresst chart.

b. Application properties: includes brush, roller, spray (airless, conventional) as applicable.

LABORATORY REPORT FORM

Contract # A4 166 48

Sample No. RDA -II-28-1
 Contract No. A5 097 48
 Date received: 3/21/86
 Log No.: 321 4A-4C
 Lab code: SU1
 Quantity: 1 Pt./2 Qts.
 Test initiated: 3/21/86
 Test completed: 12/86

Chemist: L. Kudela

Product Category: 12. Specialty Undercoaters-Wood

| Tests | Procedure | Results |
|---|---------------------|------------------------|
| 1. Total NV % Wt. | ASTM D2369 | 49.32% |
| 2. Wt. per Gallon | ASTM D1475 | 9.01% |
| 3. Viscosity Cps (Brookfield) | ASTM D2196 | 539 cp #3 (50,100) |
| 4. % Water | ASTM D1364 | 0.68% |
| 5. Stability 77°F | ASTM D1849 | 250 cp #3 (50,100) |
| 6. Stability 120°F | ASTM D1849 | 216 cp #3 (50,100) |
| 7. Freeze - Thaw Res. (All H ₂ O Based Products) | ASTM D2243 | Oil based |
| 8. Dry Time | ASTM D1640 | STT: 2 min |
| 9. Hardness | ASTM D3363 | DH: 9min |
| 10. Block Res. | STD 141B FTM 6216 | H |
| 11. Sanding Prop. | STD 141B FTM 6321 | Slight adhesion |
| 12. Humidity Res. | ASTM D2247 | * Good |
| 13. Adhesion | ASTM D3359 | Passed-no corrosion |
| 14. En. Holdout (self sealing) | --- | 4 |
| 15. H ₂ O Cleanup (All H ₂ O Based Products) | --- | 0.91 |
| 16. Flexibility | ASTM D1737 | N/A |
| 17. Appearance | --- | Pass 1/8" |
| 18. Application Properties | --- | Some mottling on steel |
| 19. Sag Res. | ASTM D2801 | Spray, brush 50% |
| 20. Levelling | ASTM D2801 | After dilution |
| 21. Bleed Res. | --- | 7 |
| 22. Alkali Res. | STD 141B FTM TTC555 | 5 |
| 23. VOC | | Fair |
| 24. Grain Raising | | Failed |
| | | 547.49 |
| | | None -pass |

*Surface smooth; no gumming of sand-paper

Note: Items 15, 17, 18 are qualitative tests. Item 14 run as described.

- a. Enamel Holdout: ratio of 60° gloss of TT489 enamel over paint vs sealed Morest chart.
- b. Application properties: includes brush, roller, spray (airless, conventional) as applicable.

LABORATORY REPORT FORM

Contract # A4 166 48

Sample No. RDA -II-28-2
 Contract No. A5 097 48
 Date received: 4/10/86
 Log No.: 410 6A-6C
 Lab code: SU2
 Quantity: 1 Pt./2 Qts.
 Test initiated: 4/11/86
 Test completed: 12/86

Chemist: L. Kudela

Product Category: 12. Specialty Undercoaters- Concrete

| Tests | Procedure | Results |
|---|---------------------|--|
| 1. Total NV % Wt. | ASTM D2369 | 12.61% |
| 2. Wt. per Gallon | ASTM D1475 | 9.13 lbs/gal |
| 3. Viscosity Cps (Brookfield) | ASTM D2196 | 12.5 cp #1 (50,100) |
| 4. % Water | ASTM D1364 | 74.8% |
| 5. Stability 77°F | ASTM D1849 | 14.5 cp #1 (50,100) |
| 6. Stability 120°F | ASTM D1849 | 12.6 cp #1 (50,100) |
| 7. Freeze - Thaw Res. (All H ₂ O Based Products) | ASTM D2243 | 11.9 cp #1 (50,100) |
| 8. Dry Time | ASTM D1640 | STT: 11 min. |
| 9. Hardness | ASTM D3363 | DH: 20 min. |
| 10. Block Res. | STD 141B FTM 6216 | < HB |
| 11. Sanding Prop. | STD 141B FTM 6321 | N/A |
| 12. Humidity Res. | ASTM D2247 | Good |
| 13. Adhesion | ASTM D3359 | Strong corrosion on the whole panel |
| 14. En. Holdout (self sealing) | --- | 5 |
| 15. H ₂ O Cleanup (All H ₂ O Based Products) | --- | 0.94 |
| 16. Flexibility | ASTM D1737 | Good |
| 17. Appearance | --- | Pass 1/8" |
| 18. Application Properties | --- | Smooth, waxy film |
| 19. Sag Res. | ASTM D2801 | Excellent |
| 20. Levelling | ASTM D2801 | 3 |
| 21. Bleed Res. | --- | 10 |
| 22. Alkali Res. | STD 141B FTM TTC555 | Poor |
| 23. VOC | | Failed 48 hrs |
| 24. Grain Raising | | 1. 137.38 2. 743.80 |
| | | Slight |

*Brushing on concrete good. Water thin viscosity

Note: Items 15, 17, 18 are qualitative tests. Item 14 run as described.

a. Enamel Holdout: ratio of 60° gloss of TT489 enamel over paint vs sealed Morest chart.

b. Application properties: includes brush, roller, spray (airless, conventional) as applicable.

LABORATORY REPORT FORM

Contract # A4 166 48

Sample No. RDA -II-28-3
 Contract No. A5 097 48
 Date received: 4/11/86
 Log No.: 411 5A-5C
 Lab code: SU3
 Quantity: 1 Pt./2 Qts.
 Test initiated: 4/14/86
 Test completed: 12/86

Chemist: L. Kudela

Product Category: 12. Specialty Undercoaters-Dry Wall

| <u>Tests</u> | <u>Procedure</u> | <u>Results</u> |
|---|---------------------|--------------------------------|
| 1. Total NV % Wt. | ASTM D2369 | <u>71.29%</u> |
| 2. Wt. per Gallon | ASTM D1475 | <u>11.55 lbs/gal</u> |
| 3. Viscosity Cps (Brookfield) | ASTM D2196 | <u>2168 cp #5 (50,100)</u> |
| 4. % Water | ASTM D1364 | <u><0.1%</u> |
| 5. Stability 77°F | ASTM D1849 | <u>1564 cp #5 (50,100)</u> |
| 6. Stability 120°F | ASTM D1849 | <u>2092 cp #5 (50,100)</u> |
| 7. Freeze - Thaw Res. (All H ₂ O Based Products) | ASTM D2243 | <u>Solvent based</u> |
| 8. Dry Time | ASTM D1640 | <u>STT: 37 min.</u> |
| 9. Hardness | ASTM D3363 | <u>DH: 102 min.</u> |
| 10. Block Res. | STD 141B FTM 6216 | <u>F</u> |
| 11. Sanding Prop. | STD 141B FTM 6321 | <u>Pass 10 psi</u> |
| 12. Humidity Res. | ASTM D2247 | <u>Good</u> |
| 13. Adhesion | ASTM D3359 | <u>No blisters, no corros.</u> |
| 14. En. Holdout (self sealing) | --- | <u>5</u> |
| 15. H ₂ O Cleanup (All H ₂ O Based Products) | --- | <u>0.93</u> |
| 16. Flexibility | ASTM D1737 | <u>Impossible</u> |
| 17. Appearance | --- | <u>Pass 1/2"</u> |
| 18. Application Properties | --- | <u>Smooth</u> |
| 19. Sag Res. | ASTM D2801 | <u>Brush, spray-good</u> |
| 20. Levelling | ASTM D2801 | <u>20% reduction</u> |
| 21. Bleed Res. | --- | <u>12</u> |
| 22. Alkali Res. | STD 141B FTM TTC555 | <u>3</u> |
| 23. VOC | | <u>Fair</u> |
| 24. Grain Raising | | <u>Failed (48 hrs)</u> |
| | | <u>397.58</u> |
| | | <u>None</u> |

Note: Items 15, 17, 18 are qualitative tests. Item 14 run as described.

a. Enamel Holdout: ratio of 60° gloss of TT489 enamel over paint vs sealed Morest chart.

b. Application properties: includes brush, roller, spray (airless, conventional) as applicable.

LABORATORY REPORT FORM

Contract # A4 166 48

Sample No. RDA -II-28-4
 Contract No. A5 097 48
 Date received: 4/16/86
 Log No.: 416 6A-6C
 Lab code: SU4
 Quantity: 1 Pt./2 Qts.
 Test initiated: 4/18/86
 Test completed: 12/86

Chemist: L. Kudela

Product Category: 12. Specialty Undercoaters- Concrete

| Tests | Procedure | Results |
|---|---------------------|----------------------------|
| 1. Total NV % Wt. | ASTM D2369 | 13.31% |
| 2. Wt. per Gallon | ASTM D1475 | 6.82 lbs/gal |
| 3. Viscosity Cps (Brookfield) | ASTM D2196 | 11.3 cp #1 (50,100) |
| 4. % Water | ASTM D1364 | <0.1% |
| 5. Stability 77°F | ASTM D1849 | 13.4 cp #1 (50,100) |
| 6. Stability 120°F | ASTM D1849 | 13.2 cp #1 (50,100) |
| 7. Freeze - Thaw Res. (All H ₂ O Based Products) | ASTM D2243 | Solvent based |
| 8. Dry Time | ASTM D1640 | STT: 3 min. DH: 18 min. |
| 9. Hardness | ASTM D3363 | F |
| 10. Block Res. | STD 141B FTM 6216 | No adhesion |
| 11. Sanding Prop. | STD 141B FTM 6321 | Good-no gumming |
| 12. Humidity Res. | ASTM D2247 | Pass |
| 13. Adhesion | ASTM D3359 | 5 |
| 14. En. Holdout (self sealing) | --- | 1.00 |
| 15. H ₂ O Cleanup (All H ₂ O Based Products) | --- | N/A |
| 16. Flexibility | ASTM D1737 | Pass 1/8" |
| 17. Appearance | --- | Smooth |
| 18. Application Properties | --- | Spray, brush- good |
| 19. Sag Res. | ASTM D2801 | 3 |
| 20. Levelling | ASTM D2801 | 8 |
| 21. Bleed Res. | --- | Good |
| 22. Alkali Res. | STD 141B FTM TTC555 | Pass 48 hrs. |
| 23. VOC | | 708.87 |
| 24. Grain Raising | | Slight |

Note: Items 15, 17, 18 are qualitative tests. Item 14 run as described.

- Enamel Holdout: ratio of 60° gloss of TT489 enamel over paint vs sealed Morest chart.
- Application properties: includes brush, roller, spray (airless, conventional) as applicable.

LABORATORY REPORT FORM

Contract # A4 166 48

Sample No. RDA -II-28-5
 Contract No. A5 097 48
 Date received: 4/23/86
 Log No.: 423 5A-5C
 Lab code: SU5
 Quantity: 1 pt./2 qts.
 Test initiated: 7/15/86
 Test completed: 12/86

Chemist: L. Kudela

Product Category: 12. Specialty Undercoaters-Wood

| <u>Tests</u> | <u>Procedure</u> | <u>Results</u> |
|---|---------------------|--------------------|
| 1. Total NV % Wt. | ASTM D2369 | 63.07 |
| 2. Wt. per Gallon | ASTM D1475 | 10.92 |
| 3. Viscosity Cps (Brookfield) | ASTM D2196 | 662 cp #3 (50,100) |
| 4. % Water | ASTM D1364 | <0.1% |
| 5. Stability 77°F | ASTM D1849 | 404 cp #3 (50,100) |
| 6. Stability 120°F | ASTM D1849 | 663 cp #3 (50,100) |
| 7. Freeze - Thaw Res. (All H ₂ O Based Products) | ASTM D2243 | Solvent based |
| 8. Dry Time | ASTM D1640 | STT: 4 min. |
| 9. Hardness | ASTM D3363 | DH: 85 mins. |
| 10. Block Res. | STD 141B FTM 6216 | H |
| 11. Sanding Prop. | STD 141B FTM 6321 | Slight adhesion |
| 12. Humidity Res. | ASTM D2247 | Good |
| 13. Adhesion | ASTM D3359 | Pass |
| 14. En. Holdout (self sealing) | --- | 5 |
| 15. H ₂ O Cleanup (All H ₂ O Based Products) | --- | 0.96 |
| 16. Flexibility | ASTM D1737 | N/A |
| 17. Appearance | --- | Pass 1/8" |
| 18. Application Properties | --- | Smooth |
| 19. Sag Res. | ASTM D2801 | Spraying-Satisf. |
| 20. Levelling | ASTM D2801 | 8 |
| 21. Bleed Res. | --- | 5 |
| 22. Alkali Res. | STD 141B FTM TTC555 | Poor |
| 23. VOC | | Failed 48 hrs. |
| 24. Grain Raising | | 483.52 |
| | | None |

Note: Items 15, 17, 18 are qualitative tests. Item 14 run as described.

- a. Enamel Holdout: ratio of 60° gloss of TT489 enamel over paint vs sealed Morest chart.
- b. Application properties: includes brush, roller, spray (airless, conventional) as applicable.

LABORATORY REPORT FORM

Contract # A4 166 48

Sample No. RDA -II-28-6
 Contract No. A5 097 48
 Date received: 4/23/86
 Log No.: 423 6A-6C
 Lab code: SU6
 Quantity: 1 pt./2 qts.
 Test initiated: 7/15/86
 Test completed: 12/86

Chemist: L. Kudela

Product Category: 12. Specialty Undercoaters-Concrete

| <u>Tests</u> | <u>Procedure</u> | <u>Results</u> |
|---|---------------------|-----------------------------|
| 1. Total NV % Wt. | ASTM D2369 | <u>49.3</u> |
| 2. Wt. per Gallon | ASTM D1475 | <u>9.36</u> |
| 3. Viscosity Cps (Brookfield) | ASTM D2196 | <u>2264 cps #5 (50,100)</u> |
| 4. % Water | ASTM D1364 | <u><0.1%</u> |
| 5. Stability 77°F | ASTM D1849 | <u>2030 cps #5 (50,100)</u> |
| 6. Stability 120°F | ASTM D1849 | <u>2376 cps #5 (50,100)</u> |
| 7. Freeze - Thaw Res. (All H ₂ O Based Products) | ASTM D2243 | <u>Solvent based</u> |
| 8. Dry Time | ASTM D1640 | <u>STT: 32 min.</u> |
| 9. Hardness | ASTM D3363 | <u>DH: 69 min.</u> |
| 10. Block Res. | STD 141B FTM 6216 | <u>H</u> |
| 11. Sanding Prop. | STD 141B FTM 6321 | <u>Slight adhesion</u> |
| 12. Humidity Res. | ASTM D2247 | <u>* See below</u> |
| 13. Adhesion | ASTM D3359 | <u>Pass</u> |
| 14. En. Holdout (self sealing) | --- | <u>4</u> |
| 15. H ₂ O Cleanup (All H ₂ O Based Products) | --- | <u>0.98</u> |
| 16. Flexibility | ASTM D1737 | <u>N/A</u> |
| 17. Appearance | --- | <u>Pass 1/8"</u> |
| 18. Application Properties | --- | <u>Smooth</u> |
| 19. Sag Res. | ASTM D2801 | <u>(20% red.)</u> |
| 20. Levelling | ASTM D2801 | <u>12 mils</u> |
| 21. Bleed Res. | --- | <u>0</u> |
| 22. Alkali Res. | STD 141B FTM TTC555 | <u>Good</u> |
| 23. VOC | | <u>Pass</u> |
| 24. Grain Raising | | <u>568.99</u> |
| | | <u>None</u> |

*Slight gumming of sand paper

**Spraying satisfactory with TCE reduction

Note: Items 15, 17, 18 are qualitative tests. Item 14 run as described.

- a. Enamel Holdout: ratio of 60° gloss of TT489 enamel over paint vs sealed Morest chart.
- b. Application properties: includes brush, roller, spray (airless, conventional) as applicable.

LABORATORY REPORT FORM

Contract # A4 166 48

Sample No. RDA -II-29-2
 Contract # A5 097 48
 Date received: 3/17/86
 Log No.: 317-1A-1C
 Lab code: 015-13-00
 Quantity: 1 Pt./ 2 Qts.
 Test initiated: 3/19/86
 Test completed: 12/86

Chemist: A. Khan
L. Kudela

Product Category: 13. Waterproofing Mastics - Elastomers

| <u>Tests</u> | <u>Procedure</u> | <u>Results</u> |
|---|---------------------|--|
| 1. Total NV % Wt. | ASTM D2369 | <u>77.15%</u> |
| 2. Wt. per Gallon | ASTM D1475 | <u>9.56%</u> |
| 3. Viscosity Cps (Brookfield) spindle 7, speed= 5 | ASTM D2196 | <u>4x10⁵ cps (7,5)</u> |
| 4. % Water | ASTM D1364 | <u><0.01</u> |
| 5. Stability 77°F | ASTM D1849 | <u>4.3 x 10⁵ cps (7,3)</u> |
| 6. Stability 120°F | ASTM D1849 | <u>3.56 x 10⁵ cps (7,5)</u> |
| 7. Freeze - Thaw Res. (All H ₂ O Based Products) | ASTM D2243 | <u>Not water based (N/A)</u> |
| 8. Dry Time | ASTM D1640 | <u>STT: 3 hrs.</u> <u>DH: 20 hrs.</u> |
| 9. Ponding-H ₂ O Res. | --- | <u>5.50</u> |
| 10. Humidity Res. 120 hrs. | ASTM D2247 | <u>No rust or blistering</u> |
| 11. Adhesion | ASTM D3359 | <u>4</u> |
| 12. H ₂ O Cleanup (All H ₂ O Based Products) | --- | <u>N/A (oil based)</u> |
| 13. Flexibility | ASTM D1737 | <u>Passed</u> |
| 14. Impact Res. | ASTM D2794 | <u>Passed</u> |
| 15. Appearance | --- | <u>Smooth</u> |
| 16. Application Properties | --- | <u>Satisfactory with spatul</u> |
| 17. Sag Res. | ASTM D2801 | <u>12</u> |
| 18. Levelling | ASTM D2801 | <u>0</u> |
| 19. Contrast Ratio | ASTM D2805 | <u>0.93</u> |
| 20. Acc. Weathering | ASTM G23, D822 | <u>Pass</u> |
| 21. Elongation | ASTM D2370 | <u>47%</u> |
| 22. Tensile Strength | ASTM D2370 | <u>137 Psi</u> |
| 23. Alkali Res. (120 hrs) | STD 141B FTM TTC555 | <u>Passed-No blisters</u> |
| 24. VOC | | <u>261.92</u> |

Note: Items 12, 15, 16 are qualitative tests. Item 9 run as described.

a. Ponding water res: dried film 15 mils, 32 cm² surface sealed to vertical container, 100 gms H₂O monitored each 24 hrs. gms/M².24 hrs.

b. Application properties: includes brush, roller, spray (airless, conventional) as applicable.

LABORATORY REPORT FORM

Contract # A4 166 48

Sample No. RDA -II-29-6
 Contract # A5 097 48
 Date received: 3/21/86
 Log No.: 321 6A-6C
 Lab code: 036-13-00
 Quantity: 1 Pt./2 Qts.
 Test initiated: 3/25/86
 Test completed: 12/86

Chemist: A. Khan
L. Kudela

Product Category: 13. Waterproofing Mastics - Elastomers

| <u>Tests</u> | <u>Procedure</u> | <u>Results</u> |
|---|---------------------|---------------------------------------|
| 1. Total NV % Wt. | ASTM D2369 | <u>82.15</u> |
| 2. Wt. per Gallon | ASTM D1475 | <u>10.22</u> |
| 3. Viscosity Cps (Brookfield) | ASTM D2196 | <u>8.96 x 10⁵ (7,2.5)</u> |
| 4. % Water | ASTM D1364 | <u><0.01</u> |
| 5. Stability 77°F | ASTM D1849 | <u>1.152 x 10⁶ (7,2.5)</u> |
| 6. Stability 120°F | ASTM D1849 | <u>1.248 x 10⁶ (7,2.5)</u> |
| 7. Freeze - Thaw Res. (All H ₂ O Based Products) | ASTM D2243 | <u>N/A</u> |
| 8. Dry Time | ASTM D1640 | <u>STT: 1hr.</u> |
| 9. Ponding-H ₂ O Res. | --- | <u>DH: 20 hrs.</u> |
| 10. Humidity Res. | ASTM D2247 | <u>3.82</u> |
| 11. Adhesion | ASTM D3359 | <u>No rust or blisters</u> |
| 12. H ₂ O Cleanup (All H ₂ O Based Products) | --- | <u>4</u> |
| 13. Flexibility | ASTM D1737 | <u>N/A (solvent based)</u> |
| 14. Impact Res. | ASTM D2794 | <u>Passed</u> |
| 15. Appearance | --- | <u>Passed 60 in.-Lbs</u> |
| 16. Application Properties | --- | <u>Flat paste</u> |
| 17. Sag Res. | ASTM D2801 | <u>Spreadable with spatula</u> |
| 18. Levelling | ASTM D2801 | <u>> 12</u> |
| 19. Contrast Ratio | ASTM D2805 | <u>0</u> |
| 20. Acc. Weathering | ASTM G23, D822 | <u>0.98</u> |
| 21. Elongation | ASTM D2370 | <u>Pass</u> |
| 22. Tensile Strength | ASTM D2370 | <u>30%</u> |
| 23. Alkali Res. | STD 141B FTM TTC555 | <u>44 psi</u> |
| 24. VOC | | <u>Pass</u> |
| | | <u>220.13</u> |

Note: Items 12, 15, 16 are qualitative tests. Item 9 run as described.

- a. Ponding water res: dried film 15 mils, 32 cm² surface sealed to vertical container, 100 gms H₂O monitored each 24 hrs. gms/M².24 hrs.
- b. Application properties: includes brush, roller, spray (airless, conventional) as applicable.

LABORATORY REPORT FORM

Contract # A4 166 48

Sample No. RDA -II-29-7
 Contract # A5 097 48
 Date received: 3/24/86
 Log No.: 324 5A-5C
 Lab code: 033-13-00
 Quantity: 1 Pt./2 Qts.
 Test initiated: 3/25/86
 Test completed: 12/86

Chemist: A. Khan
L. Kudela

Product Category: 13. Waterproofing Mastics - Elastomers

| Tests | Procedure | Results |
|---|---------------------|---|
| 1. Total NV % Wt. | ASTM D2369 | <u>66.5</u> |
| 2. Wt. per Gallon | ASTM D1475 | <u>10.20</u> |
| 3. Viscosity Cps (Brookfield) | ASTM D2196 | <u>1.248×10^6 (7,2.5)</u> |
| 4. % Water | ASTM D1364 | <u>1.6</u> |
| 5. Stability 77°F | ASTM D1849 | <u>1.344×10^6 (7,2.5)</u> |
| 6. Stability 120°F | ASTM D1849 | <u>1.536×10^6 (7,2.5)</u> |
| 7. Freeze - Thaw Res. (All H ₂ O Based Products) | ASTM D2243 | <u>N/A</u> |
| 8. Dry Time | ASTM D1640 | <u>STT: 32 min.</u> <u>DH: 50 min.</u> |
| 9. Ponding-H ₂ O Res. | --- | <u>3.6</u> |
| 10. Humidity Res. | ASTM D2247 | <u>Slight blistering</u> <u>No rust</u> |
| 11. Adhesion | ASTM D3359 | <u>4</u> |
| 12. H ₂ O Cleanup (All H ₂ O Based Products) | --- | <u>N/A</u> |
| 13. Flexibility | ASTM D1737 | <u>Passed</u> |
| 14. Impact Res. | ASTM D2794 | <u>Passed</u> |
| 15. Appearance | --- | <u>Smooth, slight-grit</u> |
| 16. Application Properties | --- | <u>Spreadable with spatula</u> |
| 17. Sag Res. | ASTM D2801 | <u>> 12</u> |
| 18. Levelling | ASTM D2801 | <u>0</u> |
| 19. Contrast Ratio | ASTM D2805 | <u>0.96</u> |
| 20. Acc. Weathering | ASTM G23, D822 | <u>Pass</u> |
| 21. Elongation | ASTM D2370 | <u>240%</u> |
| 22. Tensile Strength | ASTM D2370 | <u>99 psi</u> |
| 23. Alkali Res. | STD 141B FTM TTC555 | <u>No change</u> <u>Slight red. in gloss</u> |
| 24. VOC | | <u>390.13</u> |

Note: Items 12, 15, 16 are qualitative tests. Item 9 run as described.

a. Ponding water res: dried film 15 mils, 32 cm² surface sealed to vertical container, 100 gms H₂O monitored each 24 hrs. gms/M².24 hrs.

b. Application properties: includes brush, roller, spray (airless, conventional) as applicable.

LABORATORY REPORT FORM

Contract # A4 166 48

Sample No. RDA - JFN #11
 Contract # A5 097 48
 Date received: 9/10/86
 Log No.: 910-1A
 Lab code: WM6
 Quantity: 1 gal
 Test initiated: 9/30/86
 Test completed: 12/86

Chemist: L. Kudela

Product Category: 13. Waterproofing Mastics - Elastomers

| Tests | Procedure | Results |
|---|---------------------|--|
| 1. Total NV % Wt. | ASTM D2369 | <u>45.53%</u> |
| 2. Wt. per Gallon | ASTM D1475 | <u>9.02</u> |
| 3. Viscosity Cps (Brookfield) | ASTM D2196 | <u>5595 cp #6 (50,100)</u> |
| 4. % Water | ASTM D1364 | <u>45.39%</u> |
| 5. Stability 77°F | ASTM D1849 | <u>7325 cp #6 (50,100)</u> |
| 6. Stability 120°F | ASTM D1849 | <u>Solidified</u> |
| 7. Freeze - Thaw Res. (All H ₂ O Based Products) | ASTM D2243 | <u>7835 cp #6 (50,100)</u> |
| 8. Dry Time | ASTM D1640 | <u>STT: 67 min.</u> <u>DH: 160 min.</u> |
| 9. Ponding-H ₂ O Res. | --- | <u>17.2</u> |
| 10. Humidity Res. | ASTM D2247 | <u>Excellent</u> |
| 11. Adhesion | ASTM D3359 | <u>5</u> |
| 12. H ₂ O Cleanup (All H ₂ O Based Products) | --- | <u>Easy</u> |
| 13. Flexibility | ASTM D1737 | <u>Pass 1/8"</u> |
| 14. Impact Res. | ASTM D2794 | <u>Pass 60 in. lb.</u> |
| 15. Appearance | --- | <u>Smooth</u> |
| 16. Application Properties | --- | <u>Brush, spray-good</u> |
| 17. Sag Res. | ASTM D2801 | <u>#3</u> |
| 18. Levelling | ASTM D2801 | <u>0</u> |
| 19. Contrast Ratio | ASTM D2805 | <u>0.90</u> |
| 20. Acc. Weathering | ASTM G23, D822 | <u>Pass</u> |
| 21. Elongation | ASTM D2370 | <u>1326%</u> |
| 22. Tensile Strength | ASTM D2370 | <u>105.9 psi</u> |
| 23. Alkali Res. | STD 141B FTM TTC555 | <u>Failed</u> |
| 24. VOC | | <u>1. 98.20 2. 192.62</u> |

Note: Items 12, 15, 16 are qualitative tests. Item 9 run as described.

- a. Ponding water res: dried film 15 mils, 32 cm² surface sealed to vertical container, 100 gms H₂O monitored each 24 hrs. gms/M².24 hrs.
- b. Application properties: includes brush, roller, spray (airless, conventional) as applicable.

LABORATORY REPORT FORM

Contract # A4 166 48

Sample No. RDA -II-30-1
 Contract # A5 097 48
 Date received: 3/13/86
 Log No.: 313 6A-6C
 Lab code: WS-4
 Quantity: 1 Pt./2 Qts.
 Test initiated: 3/14/86
 Test completed: 12/86

Chemist: A. Khan
 L. Kudela

Product Category: 14. Waterproofing Sealers

| <u>Tests</u> | <u>Procedure</u> | <u>Results</u> |
|--|---------------------|----------------------------|
| 1. Total NV & Wt. | ASTM D2369 | 46.19 |
| 2. Wt. per Gallon | ASTM D1475 | 8.64 |
| 3. Viscosity Cps (Brookfield) | ASTM D2196 | 9350 (#6,50) |
| 4. % Water | ASTM D1364 | 53.10% |
| 5. Stability 77°F | ASTM D1849 | 9400 (6,50) |
| 6. Stability 120°F | ASTM D1849 | 9640 (6,50) |
| 7. Freeze - Thaw Res. (All H ₂ O Based Products) | ASTM D2243 | Solidified |
| 8. Dry Time | ASTM D1640 | STT: 55 mins. |
| 9. Color | STD 141B 4249 | DH: 80 mins. |
| 10. Humidity Res. (48 Hrs.) | ASTM D2247 | Black |
| 11. Adhesion | ASTM D3359 | No blistering, slight rus |
| 12. H ₂ O Cleanup | --- | 4 |
| 13. Appearance | --- | Pass |
| 14. Application Properties | --- | Smooth |
| 15. Acc. Weathering | ASTM G23, D822 | Satisfactory; brush, rolle |
| 16. H ₂ O Repellancy | ASTM D2921 | Pass |
| 17. Alkali Res. | STD 141B FTM TTC555 | Poor |
| 18. VOC | | Pass |
| | | 1. 7.36 2. 16.24 |

Note: Items 12, 13, 14 are qualitative tests.

Application properties: includes brush, roller, spray
 (airless, conventional) as applicable.

LABORATORY REPORT FORM

Contract # A4 166 48

Sample No. RDA -II-30-4
Contract # A5 097 48
Date received: 3/19/86
Log No.: 319 2A-2C
Lab code: WS3
Quantity: 1 Pt./2 Qts.
Test initiated: 3/21/86
Test completed: 12/86

Chemist: L. Kudela

Product Category: 14. Waterproofing Sealers

| Tests | Procedure | Results |
|--|-----------------------|---------------------------|
| 1. Total NV % Wt. | ASTM D2369 | 11.09% |
| 2. Wt. per Gallon | ASTM D1475 | 8.99 lbs/gal |
| 3. Viscosity Cps (Brookfield) | ASTM D2196 | 12.3 cp #1 (50,100) |
| 4. % Water | ASTM D1364 | 81.08% |
| 5. Stability 77°F | ASTM D1849 | 17.2 cp #1 (50,100) |
| 6. Stability 120°F | ASTM D1849 | 11.3 cp #1 (50,100) |
| 7. Freeze - Thaw Res. (All H ₂ O Based Products) | ASTM D2243 | 13.2 cp #1 (50,100) |
| 8. Dry Time | ASTM D1640 | STT: 21 min. |
| 9. Color | ASTM D1544 | DH: 75 min. |
| 10. Humidity Res. | ASTM D2247 | Color #1 |
| 11. Adhesion | ASTM D3359 | Pass 48 hrs |
| 12. H ₂ O Cleanup | --- | #5 (on concrete) |
| 13. Appearance | --- | Easy |
| 14. Application Properties | --- | Smooth on concrete |
| 15. Acc. Weathering | ASTM G23, D822 | Brush, spray-good (concr) |
| 16. H ₂ O Repellancy | ASTM D2921 | Pass |
| 17. Alkali Res. | ASTM D141B FTM TTC555 | Poor |
| 18. VOC | | Failed |
| | | 1. 84.40 2. 636.98 |

Note: Items 12, 13, 14 are qualitative tests.

Application properties: includes brush, roller, spray
(airless, conventional) as applicable.

LABORATORY REPORT FORM

Contract # A4 166 48

Sample No. RDA -II-30-6
 Contract # A5 097 48
 Date received: 3/19/86
 Log No.: 319 6A-6C
 Lab code: WS5
 Quantity: 1 Pt./2 Qts.
 Test initiated: 3/21/86
 Test completed: 12/86

Chemist: L. Kudela

Product Category: 14. Waterproofing Sealers-Concrete

| <u>Tests</u> | <u>Procedure</u> | <u>Results</u> |
|--|---------------------|-----------------------------------|
| 1. Total NV % Wt. | ASTM D2369 | 5.23% |
| 2. Wt. per Gallon | ASTM D1475 | 6.61 lbs/gal |
| 3. Viscosity Cps (Brookfield) | ASTM D2196 | 8.4 cp #1 (50,100) |
| 4. % Water | ASTM D1364 | 0.08% |
| 5. Stability 77°F | ASTM D1849 | 12.5 cp #1 (50,100) |
| 6. Stability 120°F | ASTM D1849 | 10.1 cp #1 (50,100) |
| 7. Freeze - Thaw Res. (All H ₂ O Based Products) | ASTM D2243 | Oil based |
| 8. Dry Time | ASTM D1640 | STT: 20 min. DH: 105 min. |
| 9. Color | ASTM D1544 | Color #1 |
| 10. Humidity Res. | ASTM D2247 | Pass (48 hrs in HC) |
| 11. Adhesion | ASTM D3359 | 5 (on concrete) |
| 12. H ₂ O Cleanup | --- | N/A |
| 13. Appearance | --- | Smooth on concrete |
| 14. Application Properties | --- | Brush good on concr Spray good |
| 15. Acc. Weathering | ASTM G23, D822 | Pass |
| 16. H ₂ O Repellancy | ASTM D2921 | Very good |
| 17. Alkali Res. | STD 141B FTM TTC555 | Failed |
| 18. VOC | | 751.08 |

Note: Items 12, 13, 14 are qualitative tests.

Application properties: includes brush, roller, spray
 (airless, conventional) as applicable.

LABORATORY REPORT FORM

Contract # A4 166 48

Sample No. RDA -II-30-7
 Contract # A5 097 48
 Date received: 3/24/86
 Log No.: 324 6A-6C
 Lab code: WS6
 Quantity: 1 Pt./2 Qts.
 Test initiated: 3/25/86
 Test completed: 12/86

Chemist: L. Kudela

Product Category: 14. Waterproofing Sealers

| Tests | Procedure | Results |
|--|---------------------|------------------------------|
| 1. Total NV % Wt. | ASTM D2369 | 74.37% |
| 2. Wt. per Gallon | ASTM D1475 | 13.23 lbs/gal |
| 3. Viscosity Cps (Brookfield) | ASTM D2196 | 3600 cp #6 (50,100) |
| 4. % Water | ASTM D1364 | 0.40% |
| 5. Stability 77°F | ASTM D1849 | 5840 cp #6 (50,100) |
| 6. Stability 120°F | ASTM D1849 | 5695 cp #6 (50,100) |
| 7. Freeze - Thaw Res. (All H ₂ O Based Products) | ASTM D2243 | Oil based |
| 8. Dry Time | ASTM D1640 | STT: 57 min. DH: 106 min. |
| 9. Color | STD 141B 4249 | White |
| 10. Humidity Res. | ASTM D2247 | Pass (48 hrs) |
| 11. Adhesion | ASTM D3359 | 4 (on concrete) |
| 12. H ₂ O Cleanup | --- | Oil based |
| 13. Appearance | --- | Rough |
| 14. Application Properties | --- | Brush or roller only |
| 15. Acc. Weathering | ASTM G23, D822 | Pass- no change |
| 16. H ₂ O Repellancy | ASTM D2921 | Very good |
| 17. Alkali Res. | STD 141B FTM TTC555 | Pass 48 hrs |
| 18. VOC | | 406.56 |

Note: Items 12, 13, 14 are qualitative tests.

Application properties: includes brush, roller, spray
 (airless, conventional) as applicable.

LABORATORY REPORT FORM

Contract # A4 166 48

Sample No. RDA -II-30-9
 Contract # A5 097 48
 Date received: 3/13/86
 Log No.: 313-5A-5C
 Lab code: WS1
 Quantity: 1 Pt./2 Qts.
 Test initiated: 3/14/86
 Test completed: 12/86

Chemist: L. Kudela

Product Category: 14. Waterproofing Sealers-Concrete

| Tests | Procedure | Results |
|--|---------------------|--------------------------|
| 1. Total NV % Wt. | ASTM D2369 | 9.81% |
| 2. Wt. per Gallon | ASTM D1475 | 6.59 |
| 3. Viscosity Cps (Brookfield) | ASTM D2196 | 16.2 cp #1 (50,100) |
| 4. % Water | ASTM D1364 | 0.19% |
| 5. Stability 77°F | ASTM D1849 | 18.0 cp #1 (50,100) |
| 6. Stability 120°F | ASTM D1849 | 18.8 cp #1 (50,100) |
| 7. Freeze - Thaw Res. (All H ₂ O Based Products) | ASTM D2243 | Oil Based |
| 8. Dry Time | ASTM D1640 | STT: 18 min. |
| 9. Color | ASTM D1544 | DH: 17.5 hrs. (concrete) |
| 10. Humidity Res. | ASTM D2247 | Color #1 |
| 11. Adhesion | ASTM D3359 | Pass (48 hrs) |
| 12. H ₂ O Cleanup | --- | 5 (concrete) |
| 13. Appearance | --- | N/A |
| 14. Application Properties | --- | Smooth on concrete |
| 15. Acc. Weathering | ASTM G23, D822 | *See below |
| 16. H ₂ O Repellancy | ASTM D2921 | No change |
| 17. Alkali Res. | STD 141B-FTM-TTC555 | Very good |
| 18. VOC | | Pass 96 Hrs. |
| | | 712.62 |

*Brush, spray-good

Note: Items 12, 13, 14 are qualitative tests.

Application properties: includes brush, roller, spray
 (airless, conventional) as applicable.

LABORATORY REPORT FORM

Contract # A4 166 48

Sample No. RDA -II-30-10

Contract # A5 097 48

Date received: 4/11/86

Chemist: L. Kudela

Log No.: 411 6A-6C

Lab code: WS8

Quantity: 1 pt./2 qts.

Test initiated: 8/11/86

Test completed: 12/86

Product Category: 14. Waterproofing Sealers-Concrete

| Tests | Procedure | Results |
|--|-----------------------|------------------------|
| 1. Total NV % Wt. | ASTM D2369 | 13.19% |
| 2. Wt. per Gallon | ASTM D1475 | 7.87 lbs/gal |
| 3. Viscosity Cps (Brookfield) | ASTM D2196 | 274.5 cp #3 (50,100) |
| 4. % Water | ASTM D1364 | 42.34% |
| 5. Stability 77°F | ASTM D1849 | 69 cp #3 (50,100) |
| 6. Stability 120°F | ASTM D1849 | 87 cp #3 (50,100) |
| 7. Freeze - Thaw Res. (All H ₂ O Based Products) | ASTM D2243 | 111.5 cp #3 (50,100) |
| 8. Dry Time | ASTM D1640 | STT: 18 min. |
| 9. Color | ASTM D141B 4249 | DH: 145 min.(concrete) |
| 10. Humidity Res. | ASTM D2247 | N/A pigmented |
| 11. Adhesion | ASTM D3359 | Good |
| 12. H ₂ O Cleanup | --- | 5 |
| 13. Appearance | --- | Difficult |
| 14. Application Properties | --- | Smooth |
| 15. Acc. Weathering | ASTM G23, D822 | Spray, brush-good |
| 16. H ₂ O Repellancy | ASTM D2921 | Pass |
| 17. Alkali Res. | ASTM D141B FTM-TTC555 | Good |
| 18. VOC | | Failed |
| | | 1. 438.50 2. 728.28 |

Note: Items 12, 13, 14 are qualitative tests.

Application properties: includes brush, roller, spray
(airless, conventional) as applicable.

LABORATORY REPORT FORM

Contract # A4 166 48

Sample No. JFN #10
Contract # A5 097 48
Date received: 7/11/86
Log No.: 711 9A-9B
Lab code: WS9
Quantity: 2 qts.
Test initiated: 7/14/86
Test completed: 12/86

Chemist: L. Kudela

Product Category: 14. Waterproofing Sealers

| Tests | Procedure | Results |
|--|---------------------|---------------------|
| 1. Total NV % Wt. | ASTM D2369 | 70.80% |
| 2. Wt. per Gallon | ASTM D1475 | 12.36 |
| 3. Viscosity Cps (Brookfield) | ASTM D2196 | 7345 cp #6 (50,100) |
| 4. % Water | ASTM D1364 | 14.38 |
| 5. Stability 77°F | ASTM D1849 | Solidified |
| 6. Stability 120°F | ASTM D1849 | Solidified |
| 7. Freeze - Thaw Res. (All H ₂ O Based Products) | ASTM D2243 | Solidified |
| 8. Dry Time | ASTM D1640 | STT: 15 min. |
| 9. Color | STD 141B 4249 | DH: 110 min. |
| 10. Humidity Res. | ASTM D2247 | N/A pigmented |
| 11. Adhesion | ASTM D3359 | Pass |
| 12. H ₂ O Cleanup | --- | 5 |
| 13. Appearance | --- | Easy |
| 14. Application Properties | --- | Smooth |
| 15. Acc. Weathering | ASTM G23, D822 | Brush, spray-good |
| 16. H ₂ O Repellancy | ASTM D2921 | Pass |
| 17. Alkali Res. | STD 141B-FTM TTC555 | Good |
| 18. VOC | | Pass |
| | | 1. 219.62 2. 264.02 |

Note: Items 12, 13, 14 are qualitative tests.

Application properties: includes brush, roller, spray
(airless, conventional) as applicable.

00002312



ASSET